













FIG. 1.—Dr. S. Weir Mitchell's clinic at the Infirmary for Nervous Diseases, Philadelphia, January, 1902.

# INTERNATIONAL CLINICS

A QUARTERLY

OF

ILLUSTRATED CLINICAL LECTURES AND  
ESPECIALLY PREPARED ARTICLES

ON

MEDICINE, NEUROLOGY, SURGERY, THERAPEUTICS, OB-  
STETRICS, PÆDIATRICS, PATHOLOGY, DERMATOLOGY,  
DISEASES OF THE EYE, EAR, NOSE, AND THROAT,  
AND OTHER TOPICS OF INTEREST TO  
STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION  
THROUGHOUT THE WORLD

EDITED BY

HENRY W. CATTELL, A.M., M.D., PHILADELPHIA, U.S.A.

WITH THE COLLABORATION OF

JOHN B. MURPHY, M.D., ALEXANDER D. BLACKADER, M.D.,  
CHICAGO MONTREAL

H. C. WOOD, M.D., T. M. ROTCH, M.D., E. LANDOLT, M.D.,  
PHILADELPHIA BOSTON PARIS

THOMAS G. MORTON, M.D., JAMES J. WALSH, M.D.,  
PHILADELPHIA NEW YORK

J. W. BALLANTYNE, M.D., AND JOHN HAROLD, M.D.,  
EDINBURGH LONDÓN

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# CONTRIBUTORS TO VOLUME I.

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---

BABCOCK, ROBERT H., M.D., Professor of Clinical Medicine and Diseases of the Chest, College of Physicians and Surgeons, Chicago; Attending Physician to the Cook County Hospital, etc.

BOAS, I., M.D., of Berlin, Germany, Specialist in Diseases of the Stomach and Intestines.

BOISSARD, A., M.D., Accoucheur to Tenon Hospital, Paris.

GREIG, DAVID M., C.M., F.R.C.S. (Edin.), Dundee, Scotland.

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HALLOPEAU, PROFESSOR H., Professor Agrégé in Dermatology at the University of Paris; Lecturer on Dermatology at the St. Louis Hospital, Paris; General Secretary of the French Society of Dermatology.

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HOLMES, BAYARD, M.D., Professor of Surgery in the University of Illinois, Chicago.

KELLY, JAMES, M.D., Resident Physician, St. Mary's Hospital, Philadelphia.

MARNOCH, JOHN, M.A., M.B., C.M., Surgeon to and Lecturer on Clinical Surgery at the Royal Infirmary, Aberdeen.

McPHERDRAN, ALEXANDER, M.D., Professor of Medicine, University of Toronto, Canada.

MEIGS, ARTHUR V., M.D., Attending Physician to the Pennsylvania Hospital, Philadelphia.

RANDALL, B. ALEX., M.A., M.D., Clinical Professor of Otology in the University of Pennsylvania.

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WATSON, EDWARD WILLARD, M.D., Philadelphia.

WOOD, HORATIO C., JR., M.D., Demonstrator of Pharmacodynamics, University of Pennsylvania.

YOUNG, JAMES K., M.D., Instructor in Orthopædic Surgery, University of Pennsylvania; Professor of Orthopædic Surgery, Philadelphia Polyclinic.

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# Biographical Sketches OF EMINENT LIVING PHYSICIANS.

BY GUY HINSDALE, A.M., M.D.,

Assistant Physician to the Infirmary for Nervous Diseases.

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## S. WEIR MITCHELL, M.D., LL.D.

DR. WEIR MITCHELL'S career as an army surgeon is one of the most interesting chapters in the record of an eventful life. In May, 1863, Dr. William A. Hammond, who was then Surgeon-General of the United States Army, on the request of Dr. Mitchell, ordered Dr. Mitchell and Dr. George R. Morehouse to take charge of a hospital for soldiers suffering from nervous diseases. At first the patients belonging to this class were assigned to separate wards in the hospital on Christian Street between Ninth and Tenth Streets in Philadelphia. The scope of the hospital was soon enlarged so as to include patients suffering from injuries of the nerves. This hospital becoming insufficient, a new hospital, with a capacity of four hundred beds, was created in Turner's Lane, corresponding to what is now Nineteenth Street and Columbia Avenue, Philadelphia. Surgeons Charles H. Alden, U.S.A., and William W. Keen, U.S.A., were put in charge, and the Surgeon-General wisely left the surgeons free to devote their entire time to the treatment of patients, relieving them of most of the administrative duties usually connected with army hospitals. Dr. Hammond, when he left office, had established special wards or hospitals for diseases of the eye, for syphilis, for stumps, for diseases of the heart and lungs, and in this way vastly promoted the interests of the wounded and sick soldier, as well as those of science.

The Turner's Lane hospital received a multitude of cases representing almost every conceivable type of obscure nervous disease.

The medical inspectors forwarded from various fields and hospitals a vast number of cases of wounds and contusions, including rare forms of nerve lesion of almost every great nerve in the body.

Few persons have ever at any time had such an opportunity for study, and the mass of material presented was not neglected from any stand-point. The responsibility involved in the possession of an experience so unusual was conscientiously met. Careful histories of every case were taken personally by the surgeons in charge and were methodically continued until the patient was discharged. Two thousand pages of notes were thus recorded in two years and formed the foundation of many valuable publications. The physicians to whom fell this unique chance had the spirit of Lord Bacon, who said, "I hold every man a debtor to his profession; from the which as men of course do seek to receive countenance and profit, so ought they of duty to endeavor themselves, by way of amends, to be a help and ornament thereunto."

Two important papers soon appeared as a result of the service at Turner's Lane hospital,—one on "Reflex Paralysis" (Circular No. VI., Surgeon-General's office, 1864), by Mitchell, Morehouse, and Keen, which records cases of sudden palsy, the result of wounds in remote regions of the body; and a paper on "The Antagonism of Morphia and Atropia," by Mitchell, Morehouse, and Keen.

At that time (1864-65) hypodermic medication was somewhat novel, and in the terrible burning pain following injuries to nerves, which Dr. Mitchell described under the name of "causalgia," ample use was made of hypodermic injections. It was found that the subcutaneous administration of morphine in that affection was more rapid and useful if made near the site of the pain. The combined use of atropine and morphine was here first suggested, and has since been unanimously adopted in daily practice. The effects of each drug used alone were studied, then of the two together, their antagonisms made clear, and also their agreements in action and in a common tendency to enfeeble the bladder. The narcosis of morphine is lessened by the presence of atropine, but its analgesic power is unaltered.

A remarkable paper on "Malingering" was among the interesting products of this period. It was written by Drs. Keen, Mitchell, and Morehouse. An important book followed,—"Gunshot Wounds and other Injuries of Nerves," by Mitchell, Morehouse, and Keen,

Fig. 2.—United States Army Hospital for Injuries and Diseases of the Nervous system at Turner's Lane, Philadelphia, 1864.

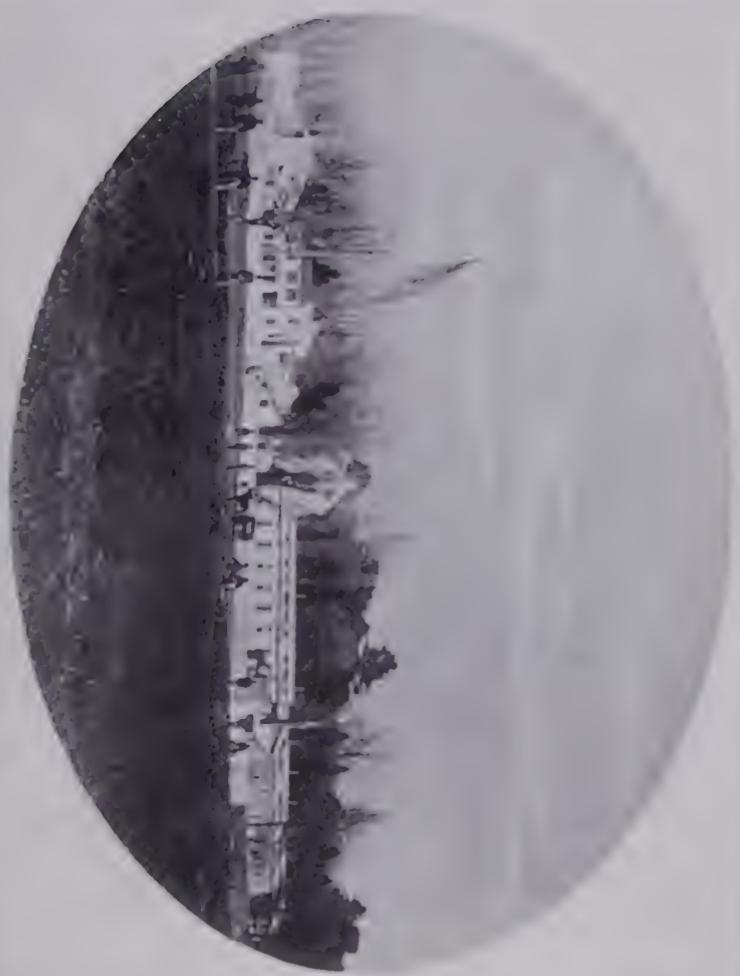




FIG. 3.—Dr. S. Weir Mitchell. (From a photograph taken during the Civil War.)

in 1864; "Injuries of Nerves and their Consequences," by S. Weir Mitchell, 1872, sums up all the later knowledge.

The remote after history of the soldier patients suffering from nerve wounds has been an interesting and untouched study, attended by all sorts of difficulties. Dr. John K. Mitchell has succeeded in securing the history of many of these Civil War cases and recorded them in a volume, published in 1895, entitled "Remote Consequences of Injuries of Nerves and their Treatment." This record is of singular value and is not confined to a study of the Turner's Lane hospital patients.

Although nearly forty years have passed, now and then a veteran of the Civil War, who remembers the faithful service in the army hospital, returns for advice, and never fails to find a welcome and a kind word of encouragement at the Infirmary for Nervous Diseases. Here Dr. Mitchell for the last thirty years has held a clinic on Friday afternoons.

Dr. Mitchell's influence on younger men in the profession has been a marked characteristic. Many a medical student has found in him a sympathetic and helpful friend. Dr. Mitchell is constantly suggesting to younger men new fields of labor and instinctively knows the lines upon which investigations may be profitably pursued. Many of these have been reported with his collaborators to the National Academy of Science, the highest scientific body in America.

The titles of Dr. Mitchell's contributions to physiology and medicine number about one hundred and forty. He has published a number of novels and volumes of poems. He holds the belief that a physician in active practice may do what else he pleases, provided that his medical life and works assure him of his competence. For this emancipating example and influence the profession owes him a grateful acknowledgment.

[*NOTE.—The illustrations show Dr. Mitchell examining one of his patients of war time, a man who had a gunshot wound of the median nerve (Fig. 1), the Turner's Lane hospital of Philadelphia (Fig. 2), and a photograph of Dr. Mitchell (Fig. 3) taken during the Civil War.]*

## JOHN A. WYETH, M.D., LL.D.

SUCCESS in the practice of medicine and surgery, as in other avocations, depends chiefly upon persistent and intelligent application. Circumstance may account for something, but the element of chance or luck is usually over-estimated. The man of quick perception and self-confidence sees and grasps the opportunity, while his less gifted brother fails to appreciate "the moment till too late to come again." Luck is with the one and against the other.

Persistent labor implies the necessity of health, and to its intelligent application there is essentially a reasonable endowment with that indefinable something which we call "common sense." The two chief causes of failure are the waste of time and the waste of energy. Idleness nearly always carries with it dissipation. In "Politian," Poe sums it up in the trite lines,—

"Late hours and wine, Castiglione,—these  
Will ruin thee!"

The conservation of strength is more essential in the medical profession than in any other, for even the most regular system of living must at times be broken into by the exigencies of practice, and these breaks in rest of body and brain should be guarded against as much as possible. Dr. Wyeth considers his health so essential to the proper fulfilment of the obligations he owes to his patients that he does not permit himself to be awakened at night except in very great emergencies, having associated with him a proficient and younger man in whose judgment he can implicitly rely as to the necessity of his being called. In this way he has the minimum of disturbance to the repose of body and mind which the regular hours of sleep give. This brings up a consideration of the value of trained and reliable help in whom perfect confidence may be placed. He has always deemed it a pleasure and a duty to show the friendliest consideration for his assistants, the nurses and servants in his hospital, and to establish with them a closer relation than that ordinarily existing between employer and employed.

Diversity in work is a happy means of getting rid of the anxiety which almost of necessity belongs to our calling. For this reason,

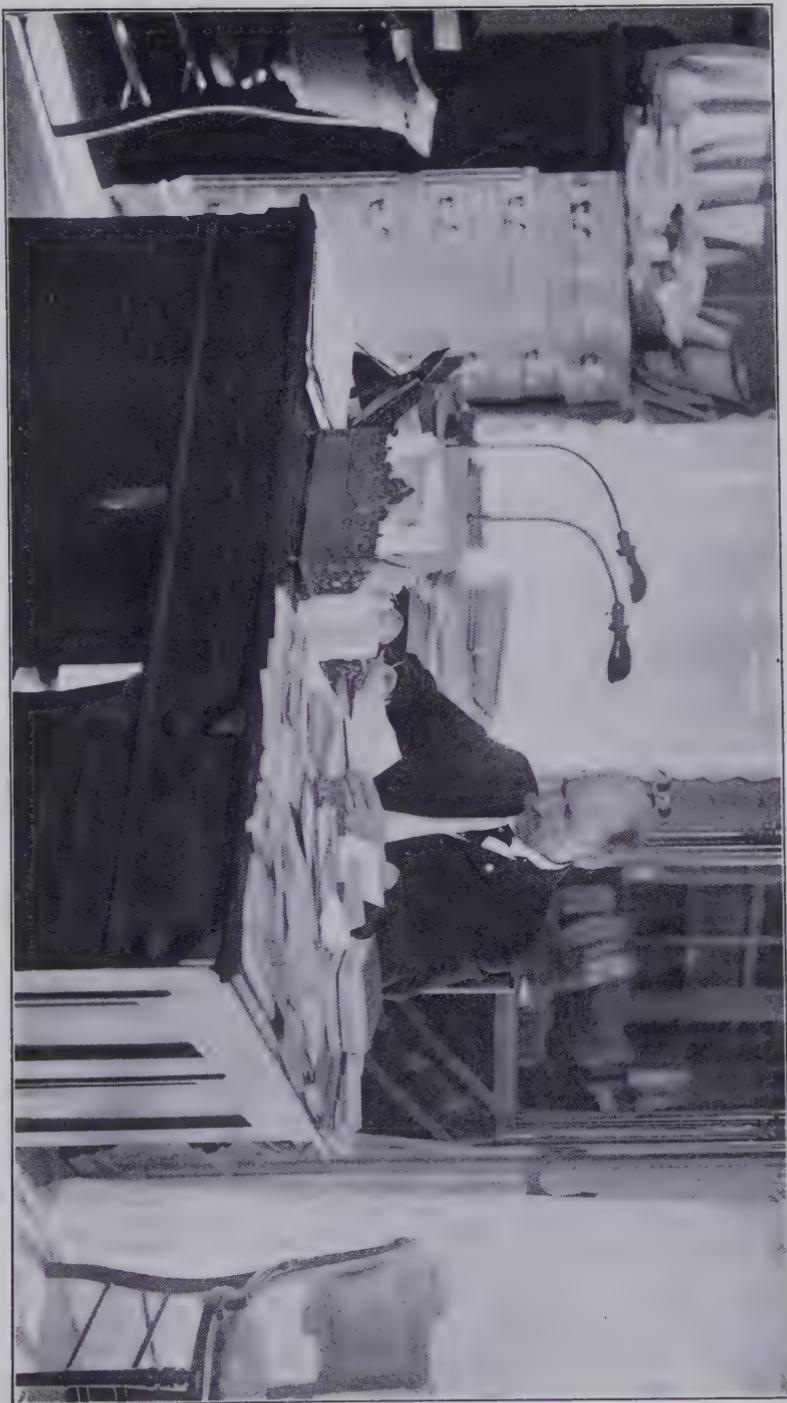


FIG. 1.—Dr. Wyeth in his private office.

FIG. 2.—Operating-room in Dr. Wyeth's private hospital.



throughout his career Dr. Wyeth has undertaken various kinds of literary work, not only because it was instructive to himself and agreeable to his tastes, but also because he felt that he could thus get relief from the cares and worries of surgical practice and might accomplish something as an author.

In the years from 1873 to 1878, in certain hours not devoted to practice he worked in the dissecting-room and laboratories and at writing essays upon surgical topics, as well as in the development of various operations which have since become more or less known in surgical literature. He spent almost every one of these leisure hours in the study of "Dextral Preference in Man," which was to him a fascinating subject. The essays on the arteries and the experimental investigations on ligation and the occlusion of the blood-vessels took three years.

In 1886 the first edition of his Text-book on Surgery appeared, and the revision of the several editions gave him quite an amount of extra labor.

His first venture in non-professional literature was the story of his experience as a prisoner of war, which appeared in the *Century Magazine*, 1891, an historical sketch for *Harper's Magazine* called "The Struggle for Oregon," and various articles on some of the military campaigns of the Civil War which appeared in *Harper's Magazine* within the last four or five years. In 1896 he began the "Life of General Nathan Bedford Forrest," and, as it was written from the official records of the war and from a very extensive correspondence with survivors and participants in the campaigns described, the amount of research and of letter writing and reading which this implied can scarcely be realized. While thus engaged he was also revising his Text-book on Surgery. Although both these works had to be furnished to the publisher in the same year, he did not neglect his practice nor forego lecturing twice a week at the hospital and college clinics.

One of the greatest aids in the saving of time and labor he finds to be the stenographer; he has been able to keep as many as three employed at one time. In a very busy period he is up at 6 A.M., and after coffee he works at his desk until breakfast at 8. The time from 8.30 to 1 P.M. is given to the office and private hospital. At 2 o'clock, after office hours and luncheon, he goes comfortably to bed and dictates for one or two hours, or until four, then rests and

usually sleeps until five, then goes out of doors for air and exercise until 6.30. From 8 P.M. until 11 his task is at the desk, and from 11 P.M. to 6 A.M. in bed. By living up to a simple system like that outlined above a great deal can be accomplished with the minimum expenditure of energy.

All his important operations he does in the morning, usually from 8.30 to 11.30 o'clock, because he is fresher, clearer, and stronger and can do better work at that time than later in the day, and also because it is then better for the patient, who would otherwise, in addition to being deprived of food, have to suffer from the anxiety which is natural to one about to try the hazard of an operation.

In the public clinic and at the college he has never tried so much to be an attractive lecturer as to have instructive material for his students (usually men who have been in the profession from one to twenty years) and to place it before them in such a way as to make it most useful to them in their work at home; in other words, to get the patient, the student, and the teacher close together. He holds that, from the best informed to those who know the least, all are children in a kindergarten, and it is from observation and questioning that we learn most readily. He never permits an assistant or any one else to be on the side of the table nearest to the audience. All the work is done from one side, and, when the safety of the patient will permit, the table is tilted up so that the light will fall well upon the operative field.

Carlyle said, "Genius is the capacity for taking infinite pains." This is trite, but not sufficiently comprehensive. It is the capacity to lay out a plan of life based on a fairly correct appreciation of one's ability and, putting aside frivolity and dissipation, to work unceasingly for success.

[NOTE.—The illustrations show Dr. Wyeth seated at his desk in his private office (Fig. 1), the operating-room of his private hospital (Fig. 2), and Dr. Wyeth's clinic (Fig. 3) at the New York Polyclinic Hospital.]



FIG. 3.—Dr. Wyeth's clinic at the New York Polyclinic Hospital.



# **Therapeutics**

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## **THE USE OF OPIUM IN DAILY PRACTICE.**

CLINICAL LECTURE DELIVERED AT THE PENNSYLVANIA HOSPITAL.

BY ARTHUR V. MEIGS, M.D.,

Attending Physician to the Pennsylvania Hospital, Philadelphia.

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GENTLEMEN,—Two weeks ago I spoke to you of diagnosis, and I told you that it occupies the greatest part of my time in the hospital wards; therefore, in delivering clinical lectures, I generally spend more time in the discussion of diagnosis than of any other subject. To-day I shall take up an important therapeutic question,—the ordinary use of opium in the practice of medicine. I think it is somewhat the custom nowadays to decry the use of opium. Within the last ten or fifteen years there has been what might almost be called a crusade against the use of opium in peritonitis, and this has led many physicians to think opium a less valuable remedy than it really is. When I began to practise, about thirty years ago, many physicians were ashamed to confess that they used mercury. So many people were injured by the over-use of mercury forty or fifty years ago that the drug fell into ill repute and was seldom administered for a good while afterwards. Opium now occupies a somewhat parallel situation: it has been so much decried that many physicians are almost afraid to recommend its use. In my opinion this is very unfortunate, for I believe it is one of the most valuable remedies we have. When I was a student of medicine, I was reading a book on the *materia medica* and I came upon “Coptis.” I asked my grandfather, the late Dr. Charles D. Meigs, “What is Coptis?” He turned to me and said, “It is a useless little weed that grows in Canada, and before you are half my age you will be able to write all the drugs that you think of any use upon your thumb-nail and you will put opium at the top of the list.” That is perhaps somewhat epigrammatic, but there

is a large measure of truth in the statement. It is therefore in regard to the therapeutic use of opium that I want to speak to you to-day.

CASE I.—This patient is suffering with a disease which illustrates one of the many uses that may be made of opium. She is a Russian-Jewish woman, twenty-two years of age, and works at the sewing-machine. She tells us that she was well until the present attack seized her. For a year past she has suffered with frontal headache, worst in the afternoon. Her vision is somewhat imperfect and she wears glasses; so she thinks that part of the trouble is due to imperfect vision. Her appetite is fairly good and her menstruation normal. About four weeks ago, before her coming to the hospital, she began to have severe cramp-like pains in the abdomen. For a few days the bowels were loose, there being as many as four or five movements a day. Since this looseness disappeared—that is to say, during the four weeks—she has been troubled with griping pain in the abdomen. Finally, during the last two weeks before admission, she was seized with vomiting. She has therefore had during four weeks alternations of diarrhoea, abdominal pain, and vomiting.

When she came to the hospital we saw that she was a thin, delicate-looking young woman, but she presented no symptoms of any organic disease. Many of the sewing-women are unhealthy people, and this is especially apt to be the case with newly arrived immigrants. They are often anaemic. This girl's lips were pale and she was anaemic, and yet there was nothing to lead us to any other diagnosis but that of diarrhoea, with more abdominal pain than generally occurs in simple diarrhoea. I cannot tell you what led me to do it, but in the course of my examination I looked at the gums, and I saw at once that there was a distinct blue line on them, just at the margins of the teeth, and this is still distinct. If you will notice, by the two central lower incisors there is a blue line, and here by the outer incisor and the canine tooth the same blue line is distinctly to be seen. I know of only one thing that can produce this particular appearance,—poisoning by lead. The ordinary effect of lead poisoning is constipation and not diarrhoea, but now and then persons suffering from lead poisoning have irregular diarrhoea, as this woman has had, and cramp-like pains. My attaining a correct diagnosis in this case was almost

an accident, for I cannot tell you what made me examine the gums: perhaps it was because the patient had abdominal pains.

Why should a sewing-woman suffer from lead poisoning? Those who sew almost always wet the thread in their mouths in order to bring it to a fine point to thread the needle, and lead poisoning is not very rare among sewing people, for much of the thread that is used is treated with lead in the processes of manufacture. I do not know of any other source for the lead poisoning with which this patient is suffering. What is the best treatment for lead poisoning? If you will study the subject you will find that there are three ordinary indications to be met in treating lead colic: you must try to subdue the pain, you must relieve the constipation which usually exists, and we are told that something must be done to eliminate the lead from the system. Some form of opium should be given for the pain, a saline purge—Epsom or Rochelle salts—used to get the bowels open, and iodide of potassium is commonly given to eliminate the lead from the system. Most text-books in discussing the treatment of lead colic mention the administration of purgative medicine as the first and most important thing to be done. They seem to voice the opinion that if the bowels are opened the pain will cease, that the pain is in some way dependent upon the constipation. The relief of the pain is mentioned as of secondary importance, and it is implied that if the constipation is relieved the pain will cease. In my experience such is not the case. I have more than once in this hospital seen it happen in cases of lead colic with constipation that purgatives were given until the bowels were freely opened and yet the pain persisted. I have learned therefore to believe that the first indication to be met in lead colic is to relieve the pain and that the constipation should be allowed to wait for treatment. If you first relieve the pain, you will find it easier to get the bowels open and the patient will recover from the lead colic more satisfactorily in that he will have had to endure much less pain, and I believe the recovery will be more speedy.

I have formulated for myself a definite system of treatment for cases of lead colic. I give one-fourth grain of powdered opium and one-twelfth grain of extract of belladonna every two hours during the entire twenty-four hours, and one-half ounce of Rochelle salt morning and evening. I often go on for two or three days with

this treatment and bide my time about getting the bowels open. If you make a calculation, you will find that the total amount of opium is three grains a day, but I direct that an additional dose of some form of opium shall be given once or twice a day if the pain is severe. The opium and belladonna are given at stated intervals, and at night I have ten or fifteen drops of laudanum or one-fourth grain of morphine or a dessertspoonful of paregoric given to the patient. This extra dose of opiate given at ten o'clock at night, when one naturally expects to go to sleep, often affords great comfort. About ten, fifteen, or twenty drops of laudanum or a dessertspoonful of paregoric will often be found sufficient to induce several hours of quiet sleep. In ordinary cases of lead colic two or three days' use of the treatment recommended will be sufficient to relieve most of the unpleasant symptoms, and especially the pain, which is the thing of which people complain the most and of which they are most anxious to be rid. I have often seen the effort made to cure lead colic more rapidly than my treatment will do it. Physicians will give half a grain of opium at short intervals or will give large doses of morphine hypodermically, but I have never been able to see that such heroic doses are of any advantage. If reasonable quantities of opium do not relieve pain, large ones will not do it, and large doses depress and injure. In my opinion, time is a necessary element for the relief of pain, and your patients will be sooner cured if you do not try to go too fast.

Before I take up the consideration of the treatment of the next patient, I am going to add a word or two to what I have already said in regard to dosage in the use of opium and its derivatives. What I shall tell you is the result of my own experience, and you cannot find it in text-books nor can you obtain the information I shall give you from the Dispensatory. The Dispensatory in discussing the dose of opium mentions one-fourth grain of powdered opium as a small dose, and then goes on to say that in cases of peritonitis as much as seventy-five grains of powdered opium have been administered in the course of a day with advantage.

When a young man begins the practice of medicine and thinks that one of his patients requires opium to relieve some pain, how is he to know what dose he shall give if he has had no more definite instruction in dosage than is embodied in what I have quoted?

Precise directions as to how to begin the use of the drug are most important. I have had much experience in the use of opium for pain, and I have come to this fixed conclusion: you can with entire safety give to the ordinary human adult, without producing any symptoms of narcosis, without contracting the pupils, and without making the patient sleepy, as much as one-fourth grain of powdered opium or as much as ten drops of ordinary laudanum every two hours day and night. The knowledge that such quantities of opium and of laudanum as I have mentioned can be given with entire safety will constitute a good point of departure for any one who wishes to use the drug. More may be given in cases in which pain is severe, as for instance sometimes in lead colic, or less may be used if the pain is not severe. Every one should know how much opium can be given without injury to ordinary people, and at the same time it must be remembered that the doses I have mentioned are not very small and will produce more or less effect upon almost any one who takes such amounts. Persons suffering with pain that can be relieved will almost always obtain more or less relief from such doses, and yet no ill effects will be induced in any but patients with some idiosyncrasy which forbids the use of the drug. The effects are often most satisfactory. Ten drops of laudanum every two hours make a total of one hundred and twenty drops a day, which is about a drachm. A quarter of a grain of powdered opium every two hours makes a total of three grains in each twenty-four hours. These are most important points in regard to the use of opiates.

As yet I have said but little about morphine, because I value it less highly than I do powdered opium and laudanum; but for certain purposes it is almost essential. If you want to use morphine and you search for information in regard to the precise relative strength of the drugs, you will discover that such information is not easy to obtain. As nearly as may be, I think you may consider that one grain of powdered opium and thirty drops of laudanum are equivalents, and that to obtain from morphine the same effect that is produced by the doses mentioned you will have to give about a quarter of a grain of it. Such estimates as this are not rigidly exact, but it is necessary to have them as a working plan when one is obliged to shift from the use of one of the derivatives of opium to the other in the practice of medicine. Each different drug and

even each different form of the same drug has its own peculiar effects. In my opinion, morphine is valuable principally because it is better fitted for use in combination with other drugs than either powdered opium or laudanum. Powdered opium cannot be used in liquid preparations and laudanum often throws down a precipitate when it is mixed with other fluids. The taste of morphine also is less disagreeable, and for this reason it is sometimes very valuable. It is almost the only derivative of opium which is adapted for use hypodermically. Morphine, therefore, has many important uses, and the sulphate of morphine is the salt which is most extensively employed in medicine. But if I want to get the full effect of opium, I generally use powdered opium—in pill or in powder—or I use laudanum and ordinarily give it by the drop. If you give laudanum, you will find that there is no practical way of measuring the small quantities that are used which is so accurate as by dropping it. Drops, as every one knows, vary considerably in size. They are larger or smaller according to the form of the lip of the bottle from which they are dropped, and different droppers give different sized drops, according to their form and according to how they are held, whether perpendicularly, horizontally, or between the perpendicular and the horizontal. These differences, however, are not great enough to make it necessary to take them into account in ordering doses of laudanum. In ordering the small doses that are needed of a medicine like laudanum you will get a much more nearly accurate dose if you order five or ten drops than if you order minims; for with the ordinary measuring glasses that are in use less than fifteen or twenty minims cannot be accurately measured. Unless you have at your command—and no one ever has it in the sick room—expensive and complicated chemical apparatus, there is no way which is so accurate to obtain a small dose of a fluid as to have it dropped. I never give any special directions whether it shall be dropped from the neck of a bottle or from a dropper, of so little importance do I consider it.

Do not forget what I have said to you: you can give the ordinary human adult ten drops of laudanum or a quarter of a grain of powdered opium every two hours day and night, and you may continue it for two or three weeks, and you will induce no narcosis, the pupils will not be contracted, and the patient will not be sleepy,

and if there is pain which can be relieved this will almost always relieve it to a greater or less degree. Such doses do not ordinarily produce any ill effects and they are often of the greatest use in relieving pain.

CASE II.—This patient was in the hospital nearly six years ago suffering with organic disease of the heart. I will not read you the history, because I can in less time tell you all you will need to know of his past and present states. His condition is one of these curious but common ones of hypertrophy of the heart without valvular disease. As well as I can remember the history of his condition six years ago, and I read it carefully a day or two since, he had dropsy of the legs and was exceedingly oppressed, as these people with heart disease become when the heart fails and becomes very weak. In addition to all this the digestion failed entirely. I went into the ward one day and found the patient oppressed, gasping for breath, and pale and pinched. He was vomiting and had violent diarrhoea and was almost in a state of collapse. I examined his treatment (I had been only a day or two in charge of the ward at the time) and found that he had been taking fifteen minims of the tincture of digitalis every two hours—that is, three drachms of digitalis tincture a day—during the past seven days. I thought he would probably die, and I looked at him to see what I could do to save his life, if it could be saved. I said to myself, Here is a man suffering with the extremest form of heart-failure. He has a dilated, hypertrophied heart, and the cardiac muscle is so weak that the heart is unable to beat with sufficient force to carry on his vital functions efficiently. Those remedies are most urgently called for which will support his flagging heart muscle. Digitalis is such a remedy, but the patient had been taking enormous quantities of it for a week, and I had to consider that it might be that the digitalis had produced the vomiting which was his most threatening symptom. What was I to do? I determined, after a careful consideration of the patient's symptoms and physical condition, to try a very simple course of treatment. I determined that I would devote my efforts to the attempt to restore his digestion and that I would, for a time at least, disregard all other symptoms. I ordered that he should be given every two hours two ounces of milk, with half an ounce of lime water and two drachms of brandy. A quarter of an hour afterwards he was given in a little water

a teaspoonful of compound tincture of cardamom with two minims of chloroform and a thirty-second of a grain of morphine. All other food and medicines were stopped, and the treatment I have described was to be continued whether the patient was better or worse, or even if it was thought he was dying. It was after great hesitation and with some doubt that I stopped the digitalis in this case, for it seemed as if the failing heart must stand still if something was not done to support it. I have, however, great faith in the sustaining properties of small doses of opiates, and chloroform in small doses is strongly stimulating. The food too in such a condition is most important; it must be given in small quantities, concentrated, and easily digestible. In ordinary instances I leave a good deal of latitude to the resident physician to make such changes as they think desirable in the intervals between my daily visits; but in this case I gave rigid directions that no other food or medicine except that I had ordered should be given until I saw the patient again the next day. At the end of the first twenty-four hours the symptoms did not appear to be alleviated in the least. The patient was still pale and pinched, and vomiting constantly, so that I feared he would die; but I directed that the same treatment should be continued for another day. At the end of the second day there was no change that can be described in the symptoms, but something in his expression made me believe that he was a little better, so I was encouraged to continue my treatment. From that time he continued to improve little by little so that after a few days he was evidently out of immediate danger. He remained in the hospital several months and was finally discharged, still suffering with heart disease, but in comfortable condition. When I recognized this patient in the ward a few days ago, I was amazed to find that he was still alive. That a man suffering with such extensive organic disease of the heart and with total failure of digestion, so that it seemed from hour to hour as if he would die, should have been able to live for six years and at the end of that time appear not to have become materially worse, shows how careful one ought to be in prognosis in chronic disease. The patient tells us he has never been able to do any work during the past six years and that he has been subject to attacks of vomiting and diarrhoea; he has also been short of breath if he made too much effort; but otherwise he has been fairly comfortable. It is my belief that this

man would have died if it had not been that my treatment was good and suited to his state of disease.

The practice of medicine often seems to me like the game of whist. No amount of skill will enable one to win if all the trumps are in the adversaries' hands. It is only if the cards are nearly evenly balanced that good play can snatch the victory. In the practice of medicine some of the cases of disease we are called upon to treat are so trivial that the patients must recover, while others are so desperate that they must die. There is another class of cases in which the outcome is doubtful and the result may then depend upon the skill of the physician. I have often been impressed by the wonderful effects of a thirty-second of a grain of morphine with two minims of chloroform given every two hours for vomiting. The sustaining and soothing effects of the anodyne are very great. The question of dosage is a very important one, and the quantity of morphine, although very small, seems to me to have been sufficient. Too large a dose will defeat the purpose. I think you will find that opium and its derivatives are exceedingly useful in certain forms of vomiting and in many cases of diarrhea.

CASE III.—This young man is a gardener. He has had several attacks of acute rheumatism; the first attack occurred when he was fifteen years of age. He was in the hospital two years ago suffering with rheumatism, and was again admitted to the medical wards several months ago. He has organic disease of the heart. The heart is hypertrophied and there is probably mitral stenosis. How these conclusions were reached I will not now discuss with you, for it is in regard to the treatment especially that I wish to speak. The action of the heart is exceedingly irregular and the patient suffers with a great deal of oppression, which is worst after he eats. He tells us that he catches cold easily and when he has a cold he often spits some blood. This is quite a common symptom in persons with organic disease of the heart and especially in those with mitral disease. Soon after I took charge of the case I was struck by the fact that, although his heart action was very irregular and he was at times much oppressed, he was not at all cyanosed nor was there any evidence of heart failure or even that his circulation was very defective. He had been nearly two months in the hospital and had taken a good deal of digitalis, and, although he had somewhat improved, his condition was still quite distressing. Thinking

some change of treatment might be made with advantage, I directed that he should be given a twenty-fourth of a grain of morphine with two minimis of chloroform in a teaspoonful of compound tincture of cardamom every two hours. This he took for a few days, and then I reduced the amount of the medicine, giving a dose only every four hours instead of every two. The effect was excellent, for the heart in two weeks has become much less irregular in its action and he has less oppression after eating. [NOTE.—Three weeks after the lecture the patient had improved continuously, the cardiac action was almost regular, and he was dressed and about the ward. The anodyne had been stopped and he was taking ten drops of tincture of digitalis three times a day.]

The moderate use of opium in cases of heart disease is sometimes of the greatest advantage; it will relieve pain and often gives the most important aid in re-establishing the regularity of the cardiac action.

It may be useful if I now say a word about cases in which you should not give opium. Thirty years ago opium was a great deal given in cases of acute insanity. In the violent excitement of acute mania, which is a very terrible thing to see, a physician is often asked by the friends to give some anodyne, if perchance the patient is so situated as to have to remain in a private house for a time. Opium and morphine should seldom be given in such cases. The majority of the superintendents of insane asylums are opposed to the use of opium in insanity unless it be in small doses and for some especial purpose. Most of them used it a great deal many years ago, but they have now come to a general agreement that its administration is disadvantageous. Some years ago I attended a young woman who had been toying with that dangerous fad which is miscalled Christian Science. She became suddenly acutely insane. I was called to the house quite late in the evening, and found the patient violently excited and suffering with delusions. Her condition can only be described by saying that she raged from room to room in the house and up stairs and down again, and constantly tried to escape into the street, for she was possessed with the idea that she must go somewhere, although none of us could find out where, or what it was she did wish to do. All efforts to soothe her failed entirely, and any attempt to restrain her movements seemed only to excite her the more. After some time it seemed as if her family

could not bear it any longer, and they begged me to do something—anything—to quiet the patient. I was finally tempted to give her a half grain of morphine hypodermically. After from a quarter to a half hour the pupils became contracted to pin-points, and the face was shrunken and pinched, and yet the excitement seemed, if possible, to be increased. My opiate had failed to soothe in the slightest degree, but the large dose given hypodermically had weakened the action of the heart and depressed the woman's vitality to such a degree that I was almost frightened. I made up my mind at the time that the treatment was ill-fitted to the disease and that I should never try it again under the same circumstances. That resolution I have never broken. Half a grain of morphine is a large dose and if given hypodermically it is sometimes a dangerous dose. When I was a resident physician in this hospital, one of my colleagues, who was in charge of the surgical ward, used frequently to give patients who were suffering with the pain that is usual for the first few nights after the fracture of a limb, a half grain of morphine hypodermically as the initial dose. Upon one occasion soon after he had given this hypodermic dose to a woman she fell into a state of hystero-epilepsy and for a short time seemed quite threateningly ill. My colleague was badly frightened and was more careful afterwards. I believe that it is not good practice, unless there be some extraordinary emergency that calls for a desperate remedy, to give as much as half a grain of morphine hypodermically as the initial dose to any patient to whom the physician in charge has not had the opportunity to give the drug previously and is therefore without knowledge of the individual's susceptibility to the influence of the drug.

Opium is, I think, as safe as any drug if properly used, and the key-note to success is this: when one is called upon to give opium to a patient for the first time, the initial dose should always be a small one, for afterwards it is easy to give more if the conditions seem to make it desirable. I disapprove of the common use of the hypodermic method of administering opium. By waiting a little longer just as good effects can be had under ordinary circumstances if the drug is given by the mouth, although of course the dose has to be somewhat larger to get an equal effect. Opium given hypodermically sometimes produces curious and unforeseen disastrous effects. What seem small doses are occasionally sufficient to kill.

If the hypodermic method be employed, one-half the amount that should be given by the mouth is usually sufficient. Do not misunderstand me and suppose that I mean to belittle the value of the hypodermic administration of opium. Under certain circumstances you can get the desired effect only by giving the drug hypodermically. In uræmic convulsions, for instance, I often give hypodermically a sixth of a grain of morphine with a one-hundred-and-twentieth of a grain of atropine once, twice, three times a day, and consider it a most valuable remedy for the condition, and I do not think the same effect can be produced under the circumstances by giving the drugs by the mouth. In dealing with patients in a state of stupor, or if the nervous system has been injured so that it is doubtful if the natural power of absorption of the digestive tract can be depended upon, it is often best to use the hypodermic method of administration if it become necessary to give opium.

That which I shall now tell you is a dangerous thing for you to know, should you be unwise enough to misuse it. I often hear it said that the amount of knowledge imparted to students ought to be restricted within narrow limits; however, as future practitioners of medicine, you are justly entitled to know everything that belongs to the science of medicine. The people of the East have learned something of the use of opium that we know but little about in this part of the world. There is a series of articles on "The Ethics of Opium and Aleohol" in the *Lancet*, by F. J. Mouat. In the number for April 30, 1892, he states that, as a result of experience in the British East India service, he has concluded that opium produces little disorder or law-breaking and very few cases of death.

In the "Report of the Royal Commission on Opium,"<sup>1</sup> the following statement is made: "There was a marked preponderance of testimony in favor of the view that the common use of opium in India is a moderate use, leading to no evident ill effects, and that such excess is exceptional and condemned by public opinion. Such is the gist of the report which, with one dissentient (Mr. H. J. Wilson, M.P.), was signed by the members (nine in number) of the Commission."

Mouat,<sup>2</sup> in discussing a British East India government report

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<sup>1</sup> *The Lancet*, April 27, 1895, p. 1078.

<sup>2</sup> *Ibid.*, November 12, 1892.

on opium, takes the ground that the opium habit, either smoking or eating, is less injurious than alcohol. At the bottom of page 1091 he says, "Maharaja Narendra Krishna, with whom I was personally acquainted when in India, says that many elderly and old Hindoos take opium, and that not a few young men wean themselves from drinking habits by betaking themselves to it." Later<sup>1</sup> the same author says, "'The habits of opium smoking and of opium eating are morally and physically debasing.' This academic proposition is true only of the habits if carried to excess, and is indefensibly untrue of the moderate use of the drug, as the evidence which I have adduced appears to me to establish beyond the reach of doubt or denial by any reasonable or reasoning person. The opium broken-down drunkard is nearly unknown in India, so rare is his appearance. The moderate consumer is known to exist in thousands, possibly in much larger numbers, and amongst these are some of the finest races in India, mentally, morally, and physically, as I know of my own personal knowledge, and as is more widely and generally known by the recorded evidence of thoroughly trustworthy authorities."

In the *Nation* for April 2, 1896, is a review of a book entitled "From the Black Sea through Persia and India," by Weeks (Harpers). This review contains the following quotation from the book: "Wherever a medical officer reported on the condition of his men just returned from active service in Burmah or elsewhere, it appeared that the best soldiers, morally and physically,—those who were always exempt from such maladies as dysentery, fever, cholera, and rheumatism,—were the opium eaters; they were able to go longer without food or stimulants and to do more work. The testimony of physicians, both European and native, was almost invariably in favor of the drug when used moderately in the simple form known to native consumers. Surgeon-General Sir William Moore said he had 'often smoked opium, and really did not see where the wickedness and immorality came in. As a matter of fact, one might see more wickedness and immorality in a London gin-shop in half an hour, even on a Sunday night, than in an opium-shop during a whole year.' It has been found that opium is cheaper than wine or spirits, less detrimental to the system, and just the

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<sup>1</sup> The Lancet, November 19, 1892, p. 1153.

right agent to stimulate the indolent Oriental nature, as well as to counteract the weakening effects of a vegetable diet and scarcity of food. Many a poor ‘Ryot,’ who can hardly pull himself together for the want of proper nourishment, is enabled by its aid to do a good day’s work, while at the same time it serves him as a specific against the maladies resulting from unhealthy surroundings. . . . While scientists, philosophers, and empirics in Europe have been experimenting for ages to find the Elixir of Life, these simple Orientals have contented themselves with producing, by homœopathic doses of opium, effects analogous to those hoped for from the discovery of Dr. Brown-Séquard.”

I have read these quotations to show you how wonderful an agent opium is. Far be it from me to recommend to any one the habitual use of any narcotic, for I believe such habits are invariably pernicious; but I do think that the value of opium as a medicine is underestimated by many physicians, and for this I am sorry. Were it not that my hour has nearly expired, I should quote to you a number of authorities who highly recommend opium as a remedy of the greatest value in many of the conditions of disease of children. West, Goodhart, Eustace Smith, and Meigs and Pepper advise its use for various purposes. Authorities agree, however, that it should be administered carefully and especially that the first dose should be a small one. Of the necessity for this in giving it to adults I have already spoken to you, and it is much more important to give small doses to children at first until their capacity to bear the drug has been learned. Of all the drugs in the *materia medica* I know of none which is more useful and satisfactory and safe than opium when it is given by one who knows its peculiarities.

## HABITUAL CONSTIPATION.

SPECIAL ARTICLE.

BY I. BOAS, M.D.,

Of Berlin, Germany,

Specialist in Diseases of the Stomach and Intestines.

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CONSTIPATION is the special disease of our times. There are very few individuals who do not suffer more or less from its consequences. Among the wealthier classes particularly,—that is, those who indulge in the pleasures of the table without the necessity for taking sufficient exercise to enable them properly to digest the amount of food taken,—constipation to greater or less degrees is almost universal. While it is spoken of as a simple symptom complex, it is scarcely necessary to say that it is multiform in its causes, in its consequences, and in the conditions that render it inveterate. It is not a something which may be treated on general principles, or for which it is enough to recognize the main symptom and then give some laxative medicine to relieve it.

The condition is so common that it has become the favorite affliction on which the charlatan and the vendor of proprietary preparations depend for their most lucrative rewards. The abuse of laxative drugs, without due selection of the remedies according to the indications of individual cases, has become extremely frequent. There is no doubt that some of the obstinacy to treatment of constipation as physicians see it in people beyond middle life is due to this use of laxative medicines unsuited to the condition for which they were taken.

This is an age of laxatives, and I had occasion to say at the last meeting of the International Medical Congress, at Paris, that much of the frequency of occurrence of mucous membranous colitis in our day, as compared with the rarity of the affection a quarter of a century ago, is undoubtedly due to the persistent use and abuse of laxative remedies. The intestines endure for years the irritation of these substances, but finally a condition is induced on which

it is very easy to graft the set of inveterate nervous symptoms which we know as mucous membranous colitis. This is, however, not the only danger of the abuse of laxatives. It is extremely important, then, that constipation should be treated rationally and not merely at hap-hazard.

Chronic constipation, as it is called,—or habitual constipation, as I prefer to call it,—is not very easy to define with absolute definiteness. By the word we mean a condition in which the intestinal evacuations are either not frequent enough or are incomplete. Different people vary very much in their necessity for alvine evacuation. There are individuals for whom failure to have a movement of the bowels every day means the development of a state of constitutional discomfort as a consequence. For such people the missing of their intestinal movement on alternate days would mean a state of habitual constipation. There are, on the other hand, not a few people who have become accustomed to two defecations daily. For them failure of one of these movements may mean a state of constipation. Most practising physicians are well acquainted with individuals in whom intestinal evacuation is and always has been sluggish and who yet suffer no inconvenience because of this condition. For such people a movement of the bowels every second or third day may mean a state of normal health.

It is important, then, to recognize the bounds of normality and to consider the history of the patient's case carefully before taking up the question of remedial measures. Usually we speak of three grades of constipation,—mild, medium, and severe. One of the most important elements in determining the character of a case of constipation is the length of time that the patient has suffered from it. If the condition dates back for many years, or is perhaps known to have existed even in childhood, it is always a severe form of constipation. Many of these cases are associated with undeniably hereditary—or perhaps they might better be called family—tendencies to constipation.

Personally I consider the reaction of the individual to laxative remedies to be one of the best means of deciding as to the character of a particular case of constipation. When strong cathartics, or at times even drastic purgatives, have been used habitually for a long time, it is evident that a very insensitive condition of the intestinal mucous membrane and lack of proper peristaltic reflex

irritability are present. The administration of certain of the better-known laxatives and the investigation of their effects will enable the medical man to decide very early in the case whether he has to do with a light or a severe form of constipation and what the prognosis of the case is.

Practically all the authors who write about chronic constipation divide their cases into two groups, the spastic and the atonic forms. My personal experience with many of these cases leads me to add a third group, which I would call the fragmentary form of habitual constipation, because of the character of the evacuations.

The spastic variety is brought about by a spasmotic condition of the walls of the intestine which interferes with the passage of faeces. A well-known example of this form of constipation is very frequently seen in cases of lead poisoning. In artists, painters, lead manufacturers, and others who handle lead, there develops a spasm of the muscular walls of the intestine which may progress to the extent of producing painful contraction,—the so-called lead colic. Many other conditions may give rise to intestinal spasm, though, as a rule, these are not sufficient to produce the intense spasmotic contraction seen in lead colic. In nervous people very slight changes in metabolism may lead to the production of toxic substances that cause an irritation of the intestinal walls not dissimilar, except in degree, to that of lead poisoning. In neurasthenic states, in hypochondriacs, and in women who are suffering from pelvic disorders this spasmotic condition of the intestinal muscular coats is especially likely to develop.

In this form of constipation the faeces are slender, often resembling somewhat a lead-pencil, or are of the diameter of the little finger, long or short cylinders, though at times shot-like lumps about the size of hazel-nuts are passed. Evacuations of small, more or less spherical excrement do not always mean the presence of spastic constipation: these occur at times also in atonic constipation. When they are constant, however, a spasmotic condition of the intestines is almost surely present.

Atonic constipation is the usual form of the habitual affection. It is due to intestinal weakness. It is apt to develop where the proper mixture of dietary elements is not maintained. Sedentary people are prone to crave stimulants and to take their food in concentrated form, which does not sufficiently stimulate the intes-

tines to peristaltic action. Besides, the amount of excrementitious material left over from such food is not large enough to call for regular evacuation, and so the peristaltic habit is impaired. The stools in this form of constipation are usually drier and harder than normal, and consist commonly of rather compressed cylinders, though occasionally there are smaller scybalous masses.

The third form of habitual constipation I have called fragmentary, because it is accompanied by the evacuation of fragmentary faeces. Patients suffering from this form of the disease usually have regular evacuations, which, however, are incomplete, and there are frequent repetitions of the desire for defecation. Patients have to go to stool every two or three hours. Usually after considerable exertion a small quantity of short cylindrical or somewhat spherical lumps of fecal material is passed. Often there is a sense of pressure with bearing down and tenesmus in the rectum. Sometimes there is a feeling of fulness in the pelvic region that sends the patient frequently to stool, either without result or with the passage of but small portions of excrementitious material. This form of constipation is more common in men than in women. It seems to be due to torpidity of the lower portion of the large intestine, usually limited to the rectum. The patient's feeling that there is still fecal material in the rectum may frequently be proved correct by an examination thereof shortly after defecation. Such patients may have six, eight, or even ten stools a day. Each one of these is small and usually hard, though occasionally it may be of the consistence of soup or gruel. Before the evacuation there is an unconquerable desire to go to stool. This rectal uneasiness is especially noticeable at night. There is never any blood or mucus in the faeces and the condition is usually accompanied by a good appetite and healthy feelings of hunger.

The diagnosis of habitual constipation is ordinarily considered to be easy; in most cases it is. The very facility of the diagnosis, however, often leads to serious mistakes, by which delay in the treatment of the underlying condition is apt to ensue. Infrequency of evacuations in persons beyond middle life who have been perfectly healthy before should not be diagnosed on general principles as chronic constipation. Some narrowing of the lumen of the intestine may be present. Usually these stenotic conditions are due to malignant tumors of the bowel, which sometimes develop rather

early in life. As we learn more about them and are more careful in their diagnosis, we find that they occur even earlier than was formerly believed. If the constipation is accompanied by emaciation, the presence of a malignant growth is confirmed.

In every case of supposed habitual constipation a careful examination of the abdomen should be made in order to exclude any of the many pathological conditions that may be present. It must be remembered that adhesions of the intestines, incomplete ileus, or chronic intestinal invagination may cause severe and persistent obstruction to the passage of the fæces. Not infrequently these affections are treated at first as simple constipation.

With regard to the treatment of habitual constipation the methods to be employed are, in the order of their value, the prophylactic, dietetic, mechanical, electrical, thermic, and medicinal.

As a rule, entirely too little attention is paid to the prophylaxis of constipation. Habits of regular intestinal defecation should begin early in life and discipline should be insisted on as much as other forms of physical training. It is the duty of parents to look after the intestinal education of their children and to require them to be regular in going to stool. Where irregularities occur a physician should be consulted and under his direction such changes made in the diet as will relieve a beginning tendency to constipation. The habitual use of any form of laxatives in the early years of life must be absolutely prohibited. This question of prophylaxis is especially important in families that have a well-recognized tendency to the development of atonic constipated conditions.

Prophylaxis is also important during pregnancy. Many a woman traces her habitual constipation back to the tendency to infrequent intestinal evacuation that developed during gestation. This is apt to be worse during each succeeding pregnancy, and finally leads to serious and inveterate constipation. Besides suitable regulation of diet, pregnant women must be advised to take a proper amount of exercise during their childbearing period. This is of advantage not alone for the constipation during pregnancy, but also because the proper strengthening of the abdominal muscles is apt to make labor easier. Pregnant women, especially those of "the better classes," are prone to confine themselves too much to the house and to a life of inactivity, especially during the later months of pregnancy, when the intra-abdominal pressure and the

overstretching of the abdominal muscles are particularly liable to hamper the ordinary mechanism of intestinal evacuation.

Another important period for the prophylaxis of habitual constipation is the time of convalescence from any serious and more or less exhausting illness. After infectious diseases, such as typhoid fever, or even after rheumatism, the confinement to bed and the necessity for an inactive life, though the appetite is increasing and the body putting on weight, is apt to produce a bad habit in the matter of intestinal evacuation that will persist after return to normal health is otherwise complete. Intestinal peristalsis is very materially assisted by good habit and is hampered by bad habit. It is important, then, to warn patients when convalescing of the possibility of establishing such bad habits.

In cases of habitual constipation the diet is extremely important. It should, as a rule, be plentiful, of sufficient variety, and composed for a good part of such substances as are known by experience to excite peristalsis. A vegetarian diet, with its large amount of excrementitious material, would be the most suitable for those suffering from constipation, only that when used exclusively it often produces a tendency to gastric and intestinal dilatation and to fermentative changes that cause annoying flatulence. As a rule, then, the patients should be given a mixed diet containing such foods as leave considerable indigestible residue.

Of those substances which have been called physiological laxatives should be enumerated especially the organic acids, the mineral salts, the various forms of sugar, and the fats. Among the most common organic acids that must be considered are lactic acid, butyric acid, vinegar, and probably also other acids that in small quantities are developed from the carbohydrates during the course of digestion. Of the latter the most important are probably formic acid, caprylic acid, and propionic acid. There seems no reason to doubt that these acids have an important influence on peristalsis. In general, organic acids may easily be rendered abundant in the dietary by the use of buttermilk, sour milk, koumiss, and kefir. In the last two substances we have also the action of carbonic acid, which undoubtedly exerts a favorable influence upon peristalsis.

That the mineral salts increase peristalsis is well recognized. Common salt and Glauber salts are very common ingredients of mineral waters that are known to be good remedies for constipa-

tion. It is important, then, to have patients suffering from habitual constipation use table salt rather plentifully on their food, and also to advise them to partake freely of such salted food products as herring, caviare, sardines, smoked ham or bacon, and the like.

The various kinds of sugar have long been used as household remedies in habitual constipation. The action of the different forms of sugar is not the same, however. There seems good reason to think that milk sugar, also levulose and dextrose, have more effect upon peristalsis than cane sugar. As the result of fermentative processes, sugars become disintegrated and produce lactic acid, butyric acid, and acetic acid, which act, as has been said, upon peristalsis. Sugar may also cause transudation through the mucous membrane of the bowel and so make the intestinal contents more fluid and more easily moved. In this way the various forms of sugar have an effect similar to that which is produced by saline purgatives, as magnesium sulphate and sodium sulphate. The sugar need not be used by itself, because it is very cloying to the appetite and may have disagreeable effects upon the stomach. There are a large number of sugar-containing food products from which to select. Among these we may class all the different kinds of sweet fruits, grapes, honey, sweet milk, so-called condensed milk, the sweet wines, Tokay, Marcella, and Sauterne, and finally Pasteurized grape-juice or the freshly expressed juice of any form of fruit.

A daily diet list that is suitable for most people who are suffering from habitual constipation is given by many of the authorities on intestinal conditions. My directions to patients are about as follows. At seven o'clock in the morning take a glass of pure cold water. At eight o'clock, an abundant breakfast, with sweetened coffee, considerable butter and honey, and Graham bread or pumpernickel (coarse rye bread). After breakfast the patient should habitually go to stool. At one o'clock a mid-day meal of meat, plenty of vegetables, a salad, and preserves, with a dessert,—usually some kind of cereal pudding. At the mid-day meal a little light wine may be taken, as Moselle, or cider may be allowed. In the evening at seven o'clock a plate of meat, with considerable butter, Graham bread, preserves, and beer, and at ten o'clock, just before going to bed, fresh fruit or preserves, should be taken. In severe cases one may use, as recommended by many, half a pint or more of buttermilk or kefir between meals once or twice a day.

With a diet like this partaken of systematically constipation usually disappears and the bowel resumes the habit of regular evacuation. I have seen wonderful successes from this dietary alone, even in inveterate cases where I had hesitated to say that the constipation would be relieved by careful selection of the food. To be successful, however, the dietetic directions must be followed constantly and consistently.

As with medicinal laxatives, so also with the dietetic: the intestines may sometimes become accustomed to their use. In my own experience this has been a very rare event. When it happens, the dietetic regimen must be supplemented by other therapeutic measures, of which the mechanical treatment is the most important. For atonic constipation, massage is an extremely useful remedy. Hoffa's method of applying abdominal massage is the simplest and most practical. With the finger-tips of both hands lying one upon another, the right hand lowest if the physician is right-handed, firm downward pressure is made in the ileocaecal region; then, with the general direction of the finger-tips towards the thorax, a somewhat rotary movement is given to them. This pressure and movement should not be accompanied by a sudden deep depression of the abdominal walls. The movement must be made slowly and gradually: if it be performed suddenly, the abdominal muscles react and become contracted. The manipulations for massage are the same as those that one must employ to feel a tumor in the depths of the abdomen. The patient should be asked to draw in his breath deeply, and on each expiration the pressure should be made a little deeper. The rotary massage should proceed mainly from movements of the shoulder-joint, the fingers, hand, and elbow being held almost stiff. Beginning at the caecum the massage should follow the course of the large intestine, most attention being given to the ileocaecal region.

Constipation that is the result of localized peritonitis, such as may occur as a consequence of perityphlitis or appendicitis, may sometimes be overcome by careful massage. Needless to say, however, the greatest care is necessary in these cases. The massage must never be employed until inflammatory symptoms are long since past and the caecal region is not in the slightest degree sensitive to pressure. Massage of a quiescent inflammatory focus might cause serious injury.

A massage treatment should last about ten minutes, each manipulation being kept up for two or three minutes. The treatments should be repeated daily for four or five weeks or more; after this every two or three days for from four to six weeks longer.

Bodily movements are important in the treatment of constipation and various gymnastic exercises have been prescribed for this purpose. Too much reliance, however, must not be placed upon them as therapeutic measures. The experience of most country doctors shows that many people who take a great deal of exercise—farmers, postmen, messengers, etc., besides military officers—often suffer from a rather severe form of habitual constipation. An interesting commentary on the overvaluing of exercise in the treatment of constipation is the fact that forced feeding and the rest cure frequently result in the relief of constipation that has persisted for a long time.

More valuable than simple bodily movements for the relief of constipation are various exercises in a gymnasium, rowing, bicycling, riding, tennis, baseball, and so forth. Bicycling, though strongly recommended by some authorities, has not proved very effective in my own experience; the same thing may be said of horseback riding. Of more value for such cases is rowing, though this form of exercise is not so easily secured. The so-called rowing apparatuses are recommended by many, and would seem to accomplish the same purpose as the actual use of the oars on the water.

Systematic gymnastic exercises indoors are very useful if properly taken. To strengthen weakened abdominal muscles, the raising of the upper part of the body from the horizontal to the perpendicular position without the help of the arms or the legs and then permitting it slowly to sink back to the lying posture is especially to be recommended. After the patient has become accustomed to this movement, its accomplishment against resistance—as, for example, against the pressure of a hand laid upon the forehead—is very useful. Another valuable exercise is the raising of the knees rapidly so that the anterior surfaces of the thighs are brought forcibly against the abdominal wall.

Williams and Lauder Brunton, of London, and more recently Ewald, of Berlin, have called attention to the fact that a proper posture of the body may be of assistance in facilitating regular evacuation of the rectum. These authorities say that defecation

in the squatting position is mechanically the most advantageous for the use of the abdominal muscles with the counter-pressure of the muscles around the rectum. Every clinician knows how difficult defecation is for patients in the lying position, or when sitting with the legs extended,—as, for instance, on a bedpan. The very opposite posture, then, might be assumed to be serviceable. Unfortunately, however, it is not always practicable to have patients go to stool in the squatting position; our household arrangements do not admit of it.<sup>1</sup>

Hydrotherapy is extremely useful in the treatment of habitual constipation. Its first influence consists in the improvement of the general health. Its local effect upon the intestines, however, is also of importance. It may be given in the form of douches and injections, the latter in connection with such medical substances as oil, soap, and glycerin. Local applications of cold when made suddenly increase intestinal peristalsis. The simplest method of using this remedy is the application of cold-water packs. Of course they must be applied without a protective covering that prevents water evaporation. Even more effective is the alternate application of cold and warm streams of water upon the abdomen, the so-called Scottish douche.

In my experience the simplest and most useful method of applying sudden cold (and I have employed it for many years) is the ether douche. Once or twice a day for about five minutes at a time a fine stream of ether is sprayed from a Richardson apparatus upon the abdominal wall. About a hundred cubic centimetres of sulphuric ether are employed for each application. The cold thus developed has a strong irritative effect upon the abdominal walls and also, in my opinion, upon the intestines. This irritation is very soon followed by a pressing desire for defecation. Some very typical cases of habitual constipation that had proved obstinate to many methods of treatment yielded very readily to this remedial measure.

Many authorities on intestinal diseases are inclined to say that

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<sup>1</sup> In many of the old houses in Paris, especially those in the Latin Quarter, defecation in the squatting posture is not only possible but necessary. The older French physicians say that when this state of things obtained more generally than at present there was much less complaint of habitual constipation than there is now.—ED.

the use of medicinal remedies for constipation over long periods always has serious results. With this opinion I cannot entirely agree. I know very many healthy people who for decades, day in and day out, have used various laxatives, especially those which contained rhubarb, without the slightest disturbance of their intestinal or general condition. It would be almost impossible to get these people to abandon their simple and effective pills for an annoying and rather tiresome dietary for which no more could be promised than was already done by their easily taken medicine.

There are persons, however, in whom laxative medicines either fail to work after a while or produce local or general suffering. Their constant use after a time causes pains in the stomach or intestines, loss of appetite, and possibly diminution of weight. It is in these cases particularly that a regulated dietary gives the best results. When attention to the diet is not completely effective in producing regular evacuations, small doses of mild laxatives may be used, or even better results may be secured by occasional injections of oil or other substances.

Besides the administration of laxatives by the mouth, their direct application to the rectum in the shape of very small clysters or suppositories must be borne in mind. The most useful of these is glycerin in doses of from one to eight grammes (fifteen drops to two drachms); of course, the laxative effect is felt only in the lower part of the large intestine. Recently we have come to use other remedies in the same way,—*e.g.*, aloin, in doses of from four to eight grains, or colocynthin, the dose of which need not be more than from one-sixth to one-half a grain. Kolstock, who has had considerable experience with these very small clysters, says that they are prompt and efficacious and produce no pain. The objections to them are that the medicines are rather expensive and their use is somewhat troublesome.

A medium position between medicinal and dietetic remedies is occupied by those substances which favor peristalsis by mechanical means. Among these may be noted especially the linseed preparations. A tablespoonful of flaxseed may be boiled for a while in water and the decoction taken internally. I have always believed the laxative effect of this remedy to be due to the oil contained in the flaxseed. Personally I have been rather wary in its use, however, from the fear that some of the seeds might find their way into

the vermiform appendix and there set up an inflammatory process. This objection may seem theoretic and far-fetched, but it has kept me from making any extensive use of flaxseed preparations.

There are other methods of treating habitual constipation, but to speak of them in detail would take up too much time. There is no doubt, for instance, that electricity can be used to decided advantage in many of these cases. Balneotherapy is also an addition to the therapeutic armamentarium of the intestinal specialist.

Among the complications of habitual constipation flatulent colic is of especial importance to the general practitioner. This is a spastic condition of the intestinal canal brought on by over-irritation. In its treatment opiates in small doses are especially indicated. While opium by quieting peristalsis usually leads to the suppression of intestinal evacuation in cases of flatulent colic it has just the opposite effect. Besides relieving the pain, it will by relaxing the spasm enable normal peristalsis to act and so allow of defecation. Irritating laxatives, which might increase the spasmodic condition, or even injections, which are much more suitable for these cases, should not be given until the painful contraction ceases.

With regard to intestinal ptosis or gastro-enteroptosis, it must be remembered that this is not always a cause of constipation, but may be one of its results. An example will suffice to illustrate how this condition may develop. A perfectly healthy woman begins to suffer from constipation and uses laxatives rather frequently. Gradually these remedies fail to have their effect and defecation becomes more and more difficult and imperfect. As a result of this prolonged medication the appetite is disturbed, owing to which, and also to anxiety with regard to her condition, she takes only easily digestible food that does not leave much residue and in amount not sufficient properly to nourish her. Then anaemia begins to develop. Gastric disturbances of various kinds set in and still further decrease the appetite and the amount of nourishment taken. As a consequence of all these factors emaciation comes on. Then ptosis of the intestines occurs. This increases the constipation, and the collection of masses of fecal material leads to further relaxation of the intestinal attachments. From this vicious circle of unfavorable influences neurasthenia develops, which condition is often the terminal stage of habitual constipation. Here the enteroptosis is not the cause but the effect of the constipation.

## THYROID POISONING.

CLINICAL LECTURE DELIVERED AT THE OIL CITY HOSPITAL.

BY J. M. WARD, M.D., Ph.D.,

President of the Oil City (Pennsylvania) Academy of Medicine.

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GENTLEMEN,—Our views upon many medical subjects have radically changed in the last few years, one of the most striking changes being in the opinions held regarding the thyroid. From a small, unimportant, ductless gland, it has suddenly become a vital organ, even the slightest interference with which may prove of serious disturbance in the human economy. Remove the thyroid gland completely and you transform man created in the image of the Divine into a dull, apathetic, and idiotic being, little if at all higher than the ape. Put in too much thyroid and you get the nervous delirium, palpitating heart, trembling limbs, and bulging eyes of the condition first aptly described by the great Irish surgeon Dr. Graves.

“What is the function of the thyroid?” is a question still unsettled. The old theory, that the blood circulation in the brain was regulated by the variations in size of the thyroid, is practically abandoned. Probably the most generally accepted theory to-day in regard to its physiology is that of Brown-Séquard,—that the gland furnishes an internal secretion which is able to destroy poisonous products of metabolism, or to combine iodine in some manner with them, forming other products beneficial and necessary for the human organism, possibly for the nutrition of the nervous system. The active principle of this secretion has been called iodothyroin. This substance has lately been used as a therapeutic agent in a remarkable number of diseased states, with results good, bad, and indifferent. Among the pathological conditions in which it has been successfully employed may be mentioned obesity, psoriasis, lupus, melancholia, stuporous cases of insanity, and ununited fractures. The dose in the above cases varies from five to thirty grains *per diem*.

As an example of the untoward effects of this drug, as well as

of an unusual class of thyroid cases, I present this young lady, age twenty-eight. Her parents are living and well; the other members of the family are four brothers and three sisters, all healthy. She is descended from healthy, long-lived Scotch-Irish ancestors. One brother and two sisters of her mother suffered from chronic eczema, but there is no family history of either goitre or myxœdema. Until her present illness, with the exception of a mild attack of the ordinary diseases of childhood and a slight chlorosis, she was never sick; she had a remarkably bright intellect and always stood at the head of her classes. Menstruation began at fifteen years, was regular, painless, and of three days' duration.

For the past two years, at times especially during menstruation, she noticed an apparently symmetrical enlargement of her neck, necessitating the wearing of larger collars. No enlargement of the thyroid itself could be detected, and no interference with deglutition or phonation. She took five grains of thyroid extract three times a day at intervals for over a year, with no apparent result, the size of the neck varying without regard to the use of the drug. While engaged in teaching a district school, she boarded with the family of a physician. One night, a month ago, she went to bed as well as usual, and awakened in the morning with her face swollen past recognition, apparently continuous with her chest, the neck being obliterated and the swelling extending a hand's breadth below the clavicles, so that she was unable to button the upper part of her waist. Both arms were also somewhat puffed up. The swelling was not perfectly uniform, but contained welts of thickened tissue three or four inches long by one or two inches in breadth; the skin over the welts was of a purplish tinge. Temperature 97° F.; pulse 120; respiration 25; no pain; bowels regular; appetite good and no malaise; urine acid, sp. gr. 1030, no albumin, trace of sugar, quantity about a quart per day. She was three weeks past her regular time for menstruation when the attack came on; uterus was normal in size and position; no œdema about genitals.

The physician with whom she was boarding diagnosed the case as acute myxœdema, and sent her home twenty miles across the country, prescribing thyroid tablets (gr. v., t. i. d.). The condition just stated is that in which I first saw her. With the idea of getting rid of the œdema, I applied *tinctura iodini fortior* to the welts and increased the thyroid tablets to four a day, putting her in bed

at the same time. After a week of this treatment, there being not the slightest diminution perceptible in the oedema and no other symptoms, I changed from the tablets to desiccated powdered fresh thyroids, eight grains five times a day for ten days, with applications of iodine ointment, but with no improvement. The powdered thyroids were then stopped and thyroidin substituted, eight grains four times a day. During this week the oedema went down rapidly, leaving, however, the welts raised from an eighth to a half inch above the surrounding skin; these would subside for a day or two in one place and then reappear; they seemed to affect especially the right side, extending in front as low as the seventh rib. She developed an annoying dry, hacking cough, as if there were interference with the recurrent laryngeal nerve.

With the disappearance of the oedema, the thyroidin was stopped and tincture of digitalis given in ascending doses up to a drachm every six hours, in a vain attempt to control an attack of tachycardia which suddenly developed, the pulse running from 150 to 200 beats to the minute for several days. Strophanthus with tincture of iron was for a short time substituted for the digitalis, in addition to applications of ice to the precordia, but with no effect. The bowels continued regular, temperature was slightly subnormal, and rapid cachexia developed though the appetite continued good. The urine suddenly became suppressed, only two ounces being voided during the day. To meet this, large doses of infusion of digitalis with copious draughts of water were given, resulting in the passage of plenty of urine and the lowering of the pulse-rate to forty. Since the pulse-rate has dropped, several important symptoms have developed; first, a tremor affecting the whole arm, the fingers not separately showing it; profuse sweats at irregular intervals daily; an apparent slight fulness of the eyeballs, though this may really be due to the wasting of the tissues of the face leaving them relatively larger looking. There is no incoördination or spasm of the upper lid, no insufficiency of convergence, no pulsating retinal vessel, and no more visible sclerotic than usual; so the supposed exophthalmos may be imaginary. As no enlargement of the thyroid can be detected, and no certain exophthalmos, and the tachycardia is not arrhythmic, the best diagnosis probably is thyroid poisoning, with an unfavorable prognosis.

Her treatment at present is symptomatic. She receives a gen-

eral massage with alcohol once a day at bedtime, a cool salt-water bath in the morning, and a twentieth of a grain of strychnine three times a day. The spurts in the pulse-rate to 160 or more are controlled pretty well now by applications of ice to the precordia. We have been trying belladonna, heroin, and morphine in succession for the most distressing symptoms at present, the dyspnœa and the harassing cough; so far she has received no benefit. There is one other therapeutic measure which might give some relief and which I propose to try,—galvanism. Removal of a part or of all but a part of the thyroid would also apparently be a rational procedure and might give some relief, but at present her condition evidently forbids this.

Glancing at a few anatomical features of the thyroid, we notice that in the foetal state the colloid secretion is poured directly into the alimentary canal through a duct at the base of the tongue. At birth this duct becomes impervious and the secretion enters the system through the lymphatics. So in after life it seems that the manner of ingestion of thyroid substance makes no difference in its physiological action. The blood-vessels of the thyroid are remarkable for their large size and frequent anastomoses; the nerves are branches of the vagus and of the cervical sympathetic ganglia which supply the cardiac nerves. This probably accounts for the frequent cardiac symptoms in most cases of thyroid disease.

This case affords an illustration of the decided toxic effects of thyroid substance. While unquestionably a beneficial remedy in certain cases, it is contraindicated in others, and, instead of being comparatively inert, it is decidedly and progressively toxic in its action and is not to be used *ad libitum* with impunity. The outcome of this case points, as the cause of the obscure symptoms in the first place, rather to exophthalmic goitre than to myxoedema, and the lesson derived from the treatment is that thyroid should not be given unless unmistakable indications call for its use.

[NOTE.—Shortly after this lecture the young lady left the hospital and passed into other hands. She continued to grow weaker until death ensued in two weeks. No autopsy was permitted.]



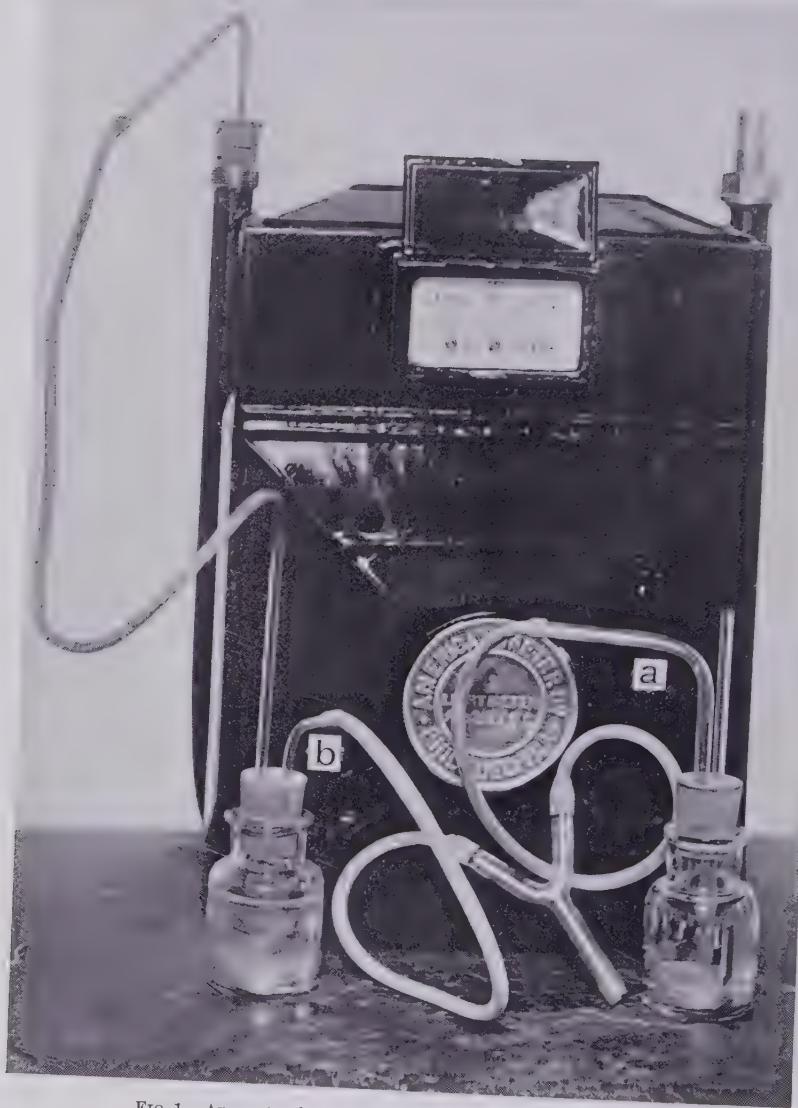


FIG. 1.—Apparatus for measuring the amount of air breathed.

## A DESCRIPTION OF THE METHODS OF INVESTIGATING THE ACTION OF DRUGS.

BY HORATIO C. WOOD, JR., M.D.,

Demonstrator of Pharmacodynamics, University of Pennsylvania.

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### PART II.

#### RESPIRATION.

PHYSIOLOGISTS divide the respiratory functions into two portions: the so-called internal respiration,—that is, the chemical changes taking place in the blood as the result of its contact on the one hand with the carbonic-acid laden tissue, and on the other with the oxygenating air in the lungs; and the external respiration, which has to do with a mechanical movement of the air in and out of the lungs. The pharmacological relation of the internal respiration is simply the study of the effects of drugs upon the blood, and will be dealt with, therefore, under that heading. We will first take up the consideration of the respiratory function proper,—that is, the portion of the act connected with the movements of air.

Formerly cognizance was taken merely of the number of respirations, and according as a drug increased or lessened the rate of the breathing was it classed among the respiratory stimulants or depressants. Such conclusions, however, are manifestly unfair, since it is evident that the frequency of the respirations might be diminished by a drug, but the volume of each one be sufficiently increased to augment the total amount of air moved, and it is the latter which is, after all, the important point to be determined.

The most accurate means of studying changes in the respiratory functions is direct measurement of the amount of air moved. This can best be done by means of an ordinary gas-meter; if this is not to be had, a collapsible rubber bag of known content may be employed (Fig. 1). For the purpose of separating the inspired from the expired air we use a pair of valve bottles, as in the illustration. Each of these is arranged in the same manner as a wash-bottle, with

one long and one short tube, and partly filled with mercury. The short tube on one side and the long tube of the other are connected, by means of the Y piece of glass, with the trachea. The tendency towards movement in the air is of course the same in both sides; during inspiration, for example, there is an equal suction in the tubes of both *a* and *b*, but in *b* the suction in the tube draws up the mercury, which acts as a valve, closing the tube and preventing the entrance of air; while in *A* the suction creates a vacuum above the mercury, the air is drawn through the long straight tube, bubbles up under the mercury, and passes into the lungs. During expiration the reverse process takes place: the air is forced out of bottle *b* while the mercury in bottle *a* closes the outlet. One of these bottles—it makes little difference which, for the expired air and inspired air, making allowance for differences in temperature and moisture, are practically the same—is connected with the meter, and the number of cubic feet of air consumed in a given time before and after administration of the drug observed.

This method gives us a very accurate knowledge of the volume of air moved, but takes no account of the changes in the rate of respiration, and has the objection that it is not applicable to graphic methods. The method of Knoll, which is occasionally employed, is based on the plethysmographic principle. A small animal is placed in an hermetically closed box, with two openings, one of which communicates with the external air and is connected with the trachea of the animal, the other being connected with a U tube upon which floats a small swimmer. During inspiration the increase in the size of the chest forces the fluid out of the box against the recording needle, which is in turn driven upward; and during expiration the animal occupies less cubic space, suction is created, and the needle drawn downward again. The box may be calibrated, so that a certain height of the wave represents a definite number of cubic feet. In this way we can get not only a very accurate record of the frequency and size of respirations but also an approximate idea of the total volume of air moved. The objections to the method are: the fact that it is suitable only for small animals, the cumbervousness of its technic, and the fact that the conditions are so abnormal that they determine the death of the animal in comparatively short intervals of time and the relations of the respiratory centres must therefore be considerably disturbed.

A very simple but convenient method, which may be used simultaneously with blood-pressure curves, is to insert into the trachea a glass tube with two limbs like the letter Y. One limb of the Y is connected with a Marey tambour, an air-tight capsule covered with an elastic membrane, the other end being left open to the air. The value of this method depends on the fact that the volume of air passing through the two limbs of the Y tube is in exact proportion to the resistance offered by the different limbs, or in other words their caliber. As long as the diameter of the two tubes remains constant, therefore, the amount of air which passes through them will always bear a constant relation. During expiration, air being forced into the tambour, the recording needle is driven upward, and, as the excursions of the needle depend upon the amount of air forced into the capsule, which in turn bears always a constant relation to the amount of air forced out of the open tube, we get not only an accurate result of the number of respirations but also an approximate idea of the depth of each respiration. Although the method does not give us any information concerning the actual number of cubic feet of air breathed, it gives us sufficient data to judge whether the volume of air has been increased or diminished.

#### BLOOD.

Drugs may affect the blood either in regard to its chemical composition or as to the vital function of the corpuscles. There are some drugs whose poisonous relations towards the blood are sufficiently active to produce their characteristic changes in this fluid during life, but most of the haemic poisons show their effects only when mixed with blood outside of the body.

The functional activity of the white blood-corpuscles is, as is well known, shown by the peculiar amoeboid movements of those cells. Changes in the activity of these movements can be seen by direct observation with a microscope. The function of the red blood-cells being to carry oxygen, lessening of their functional activity will lessen their oxidizing power. In studying such alterations advantage is taken of the changes in color which tincture of guaiac undergoes in contact with an ozonizing agent. A drop or two of the tincture of guaiac is added to a small quantity of normal blood and of poisoned blood, both of which have previously been

well shaken with the air in order to insure their being thoroughly oxygenated, and any changes in the rapidity of the oxidation of the guaiac are noted.

Although a change of the chemical composition of haemoglobin is not necessary to affect the oxygen-carrying power of the red blood-corpuscles, there are a considerable number of drugs which produce such chemical changes. Nearly all the new compounds resulting are much more stable bodies than oxyhaemoglobin, therefore destroying the power of the corpuscles to give up their oxygen. These chemical changes in the composition of the haemoglobin are usually accompanied by changes in the color of the blood, so that they are evident even at a casual glance. The exact compound which results is determined by means of the spectroscope. When rays of light are passed through a thin layer of haemoglobin before being broken up into their composite parts by the spectral prism, there is an interference with the passage of certain rays, producing corresponding shadows in that portion of the spectrum. These shadows are known as the absorption bands of haemoglobin. The absorption bands of oxyhaemoglobin are two, located in the yellow and green-yellow parts of the spectrum. If carbon monoxide is added to the blood, there results a dark band occupying almost the entire yellow portion of the spectrum; the absorption band of the compound known as methaemoglobin is found in the red. Among those substances which produce the compound known as methaemoglobin may be mentioned potassium chlorate. The compound produced by the nitrites, such as amyl nitrite, is probably of similar composition.

A subject of some importance from the stand-point of the practical therapist is the effect of drugs upon coagulation of the blood. There is a long list of substances which either delay or hasten the formation of a clot. The effects of these substances upon the coagulability of the blood may be studied either by injecting them into the circulation of the living animal or by mixing them with freshly drawn blood outside of the body. Thus, it has been shown, after gelatin is injected, either intravenously or hypodermically, the blood drawn from the body is firmly clotted in about one minute; if the blood from the animal is allowed to flow into a warm solution of gelatin, it clots equally rapidly.

## NERVOUS SYSTEM.

We now pass on to the consideration of the nervous system. Studies of the action of remedies upon the cerebrum in the lower animals are very unsatisfactory and unreliable, because the highly developed brain of man does not react to drug influences in the same manner as the comparatively undeveloped cerebrum of the lower animal. It is a fundamental truth of pharmacology that the more highly specialized is an organ, the more susceptible is it to the action of drugs; and in no case do we find this more clearly demonstrated than in the effects of cerebrally acting poisons. For example, the frog is thrown into convulsions by morphine, whereas man is put to sleep. This diversity does not indicate any essential difference in the effect of the drug on the nerve-centres, but is due solely to the fact that in man with a highly developed brain the cerebral symptoms mask the spinal, while in the frog the cord, being relatively the more important, is more sensitive to the poison. This is clearly shown by the reaction of animals in the middle scale of evolution; in the dog, the brain being comparatively large, the dominant action of morphine is on that organ, it therefore causes sleep; the horse, with a less perfect cerebrum, is at first greatly excited by this drug, but if the dose has been large enough may have later a stage of quiescence; in the rabbit, which belongs rather far down in the scale of cerebral development, we find that morphine has almost no quieting effect, acting purely as a convulsant, as it does in the frog.

Comparatively little information, therefore, concerning the effects of hypnotics or brain stimulants is to be gained from animal experimentation. It may be noted, however, that a drug which is powerful enough in its hypnotic action to quiet one of the lower animals is just the more likely to depress the sensitive brain of the human being. A fairly accurate knowledge of the action of drugs upon other portions of the nervous system may, however, be gained from animal experimentation, since it is possible to experiment on animals with all degrees of development of the spinal cord, and since it seems probable that there is little difference in the susceptibility of the peripheral nerves.

In the spinal cord, aside from the tracts in the white matter representing large nerve-trunks, we have certain ganglia, being

both sensory and motor centres. The motor ganglia in the spinal cord are true centres,—that is, they originate motor impulses. They differ, however, from the motor centres in the brain in that they are incapable of originating these impulses except in response to some stimulus received, whereas the motor area of the brain has the power of originating a motor impulse without any apparent external stimulus. There is a school of psychologists which denies that movements can arise save as the result of some external influence: that we are, therefore, not creatures of free-will, but that all our deeds are in the nature of reflex actions, the result of various external stimuli. The truth or falsity of this position is not a question for discussion in the present paper, but for practical purposes, at least as far as pharmacology is concerned, we may regard the brain as an organ endowed with the property of originating impulses entirely independently of any external conditions; contrasting with the spinal cord, whose motor impulses are the result always of stimuli received from some other point, either from the sensory cell on the other side of the spinal cord or from the brain.

Convulsions may occur as the result of the action of a drug either upon the brain or upon the spinal cord. In the distinction between cerebral and spinal convulsions we have recourse to the very logical method of destroying the brain and noting whether or not the convulsions are affected. This operation, which is a very serious one in the mammal, is in the frog a comparatively trivial one.

If to the frog is given a full dose of a spinal stimulant, as strychnine, there follows a stage in which any irritation causes a more active response than normal. If the dose has been large enough, after a few minutes there occurs a sudden convulsive movement, the hind legs are forcibly extended, the fore legs are stiff and half bent towards the chest, the animal retaining this position for probably several seconds.

The position assumed in the spinal convolution in the frog or in any other animal, the motor impulses being sent to all the muscles of the body, depends upon the comparative power of the opposing group of muscles. Thus, in the frog the extensors of the hind leg are more powerful than the flexors, and the characteristic position of the spinal convolution is with the limbs extended. In man the back muscles are more powerful than the abdominal, and in strychnine

nine poisoning the opisthotonic position is frequently assumed; the biceps being, as a rule, stronger than the triceps, we will find the arms more commonly flexed than extended; in other words, every muscle of the body contracting with its utmost power, the position depends entirely upon which is the most powerful muscle.

These convulsions being spinal, or in other words reflex spasms, occur only as the result of sensory impulse. Frequently, however, they appear to arise spontaneously. The body is constantly exposed to sensory impulses, so slight, however, that they call forth no reflex action; but in a state of heightened susceptibility of the motor cells, resulting from the influence of the spinal stimulant, these irritations, slight as they are, are sufficient to call forth a violent tetanic convulsion. Thus, I have seen the strychninized frog thrown into a rigid spasm by a draught of air or even by a loud noise.

The first fact to be determined concerning these convulsions is whether they result from the action of the drug upon the brain or upon some portion of the nervous system below. As the cerebrum of the frog seems to have little connection with its vital functions, we can destroy this organ without in any way seriously interfering with the life of the animal for the time being.

After destruction of the brain the convulsions caused by strychnine are every whit as violent as in the normal animal, showing that they are not due to any action upon the brain. If, however, the spinal cord has been destroyed the convulsions do not occur, no matter how large the dose of the strychnine; showing that they are not brought about by an action on any portion of the peripheral motor apparatus, but are spinal in origin. More direct proof of this fact can be obtained by opening the vertebral canal and applying the poison directly to the spinal cord, when we will find convulsions produced in those portions of the body which are supplied by the part of the cord to which the poison has been applied.

A drug may, without being powerful enough to cause convulsions, act as a spinal stimulant, causing an increase of the reflex activity; it is necessary, therefore, to have some means of more accurately determining the condition of the reflex centres. For this purpose the most generally useful method is that devised by Turck, which method is based on the fact that the length of time necessary for a reflex response depends on the activity of the nervous

system. Since impulses pass along the nerve-trunks in an almost infinitesimal portion of time, nearly the whole of a reflex time being consumed in the cord, any agent which increases the functional activity of the spinal centres greatly lessens this time, and any influence depressing the cord lengthens it. In the proper understanding of this method we must bear in mind a few cardinal facts concerning the physiology of the central nervous system of the frog (Fig. 2).

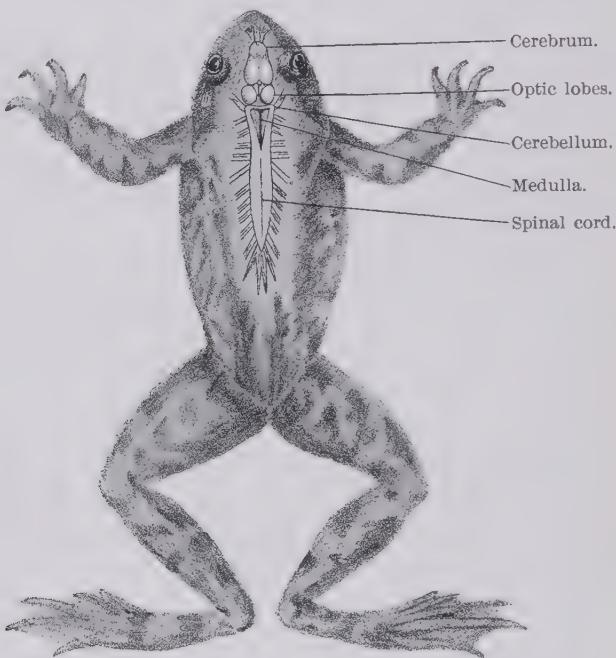


FIG. 2.—Central nervous system of frog.

These nerve-centres have, of course, their own special functions, but none of them are immediately necessary for life in the batrachian; that is, it will live for a considerable period of time even after complete destruction of all the higher nerve-centres.

If merely the cerebrum is destroyed, there is no apparent alteration in the animal; it jumps on irritation, avoiding obstacles in its road; it sits in the normal position, will croak when stroked, and its reflexes are in no way disturbed; the only thing lost is the power of moving at will. After destruction of the optic lobes the frog loses the power of perception of obstacles which may be placed in its way. Section of the cord immediately below the cerebellum





FIG. 3.—Turck's method of studying the activity of the reflex centres. (The frog's brain is destroyed so as to abolish sensation.)

or medulla interferes with coördination of the movements of the batrachian, but not with reflex activity.

Turck's method is performed in the following manner. A section of the spinal cord is made immediately below the brain, so as to prevent any interference through voluntary movements, and the brain destroyed. The exact level of this division is not of very great importance, provided it is not low enough to interfere with the nerve supply of the posterior extremities; in the illustration (Fig. 3) the white mark shows the ordinary position for dividing the spinal cord. The animal is then hung and the reflex time tested from time to time before and after the administration of the drug. In order to get accurate results it is necessary to have an irritation which shall always remain absolutely constant. Mechanical or electrical irritation of the skin is bound to vary in its effects; therefore, a chemical irritant in the form of a very dilute solution of a mineral acid is used. The foot of the frog is immersed in the acid solution, and the length of time is counted by an ordinary metronome such as musicians use, which is usually arranged to mark about one hundred and fifty beats per minute. Having made a number of tests to determine the normal reaction time, after each of which the foot is washed in plain water, the remedy being studied is administered and any change in rapidity of response noted. If the drug given was a spinal stimulant, like strychnine, the time required for a reflex response is shortened. If, on the other hand, we have been experimenting with a substance such as chloral, the reflex time is prolonged, and if the dose has been large enough a stage comes when there is no reflex response at all, even when using much stronger acid.

Paralysis following administration of a drug may be due to one of several causes. If there is merely a loss of voluntary motion we would take it for granted that it was the brain which was especially affected. Paralysis of the sensory nervous system is betokened by a loss of reflex movement at a time when voluntary power is conserved. As long as the animal can move of its own will it is evident that the entire motor tract from the brain to the muscle is in good working order, and any loss of reflex action, therefore, must be due to agencies interfering with the passage of sensory impulses from the periphery to the motor ganglia in the cord. On the other hand, if there is failure of both voluntary and reflex action it indicates that the palsy is in some portion of the locomotor apparatus

below the brain, either the spinal cord, the motor nerve, or the muscle.

In such a case the sciatic nerve is exposed and stimulated with an electric current. If we get a normal contraction it shows that the paralysis is not peripheral and must therefore be in the cord. If there is a decrease in the irritability of the motor nerve, indicating a peripheral palsy, a second experiment is made in which one leg of the frog is protected from the action of the drug by ligation of the artery. If the paralysis is a peripheral one the palsy will not occur in the protected leg as early as in the part exposed to the poison.

To determine whether a peripheral palsy has been brought about by an action upon the motor nerve or upon the muscle substance the electrodes are applied directly to the muscle, a response indicating maintenance of muscular power. More careful studies are made by preparing the gastrocnemius with a portion of its tributary nerve and separating them entirely from the body (Fig. 4). The irritability of the preparation having been first determined, the motor nerve of one side and the muscle of the other are placed in a dilute solution of the poison—care being taken in both instances to keep the part which is not in the solution moistened with a seven-tenths per cent. solution of sodium chloride to prevent death from drying—and tests made from time to time of the irritability of the preparation. Suppose that we find, as happens from curare, that the motor nerve which has been in the solution has not been affected, but that the muscle which has been in the solution does not respond to stimulation of the nerve but contracts when the electrodes are applied directly to it. Since the muscle substance is irritable, it is evident that the paralysis is in some portion of the motor nerve, but the nerve-trunk which has been directly in the solution is not paralyzed. It must therefore be the intramuscular terminations of the motor nerve which have been affected, the poison entering the muscle by a process of osmosis to reach the nerve-endings. It will be remembered that the motor end-plates are more highly specialized tissue than the nerve-trunks, and it is therefore not surprising to find them more readily affected by drugs than are the nerve-trunks.

Drugs may produce considerable changes in the activity of the muscle without completely paralyzing it. For example, a poison like veratrine may alter the form of the muscle-curve. The muscle-

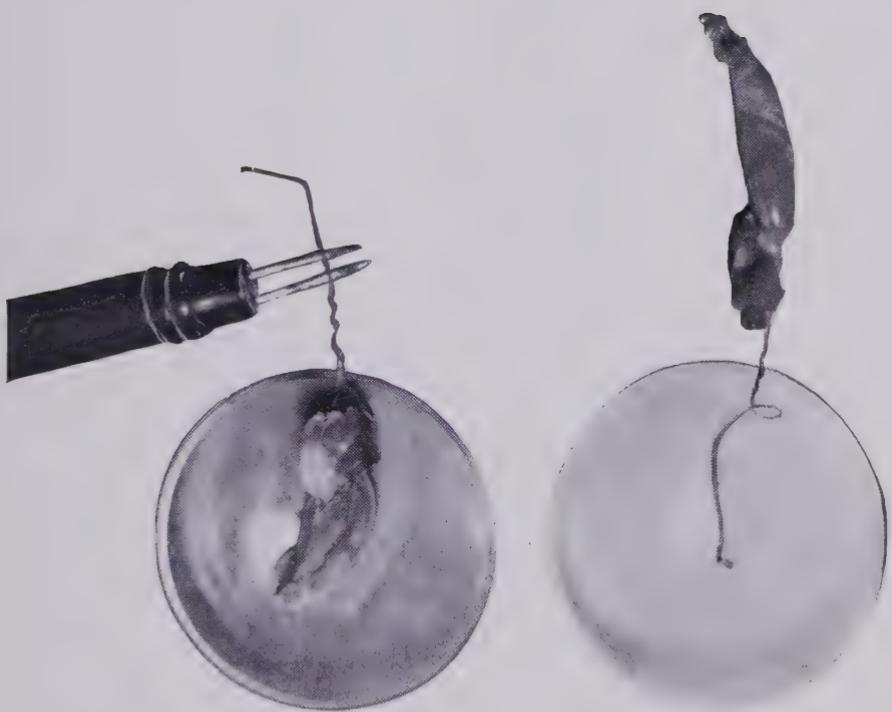


FIG. 4.—Method of determining whether a peripheral palsy is due to the motor nerve going to the muscle, or to the muscle itself.

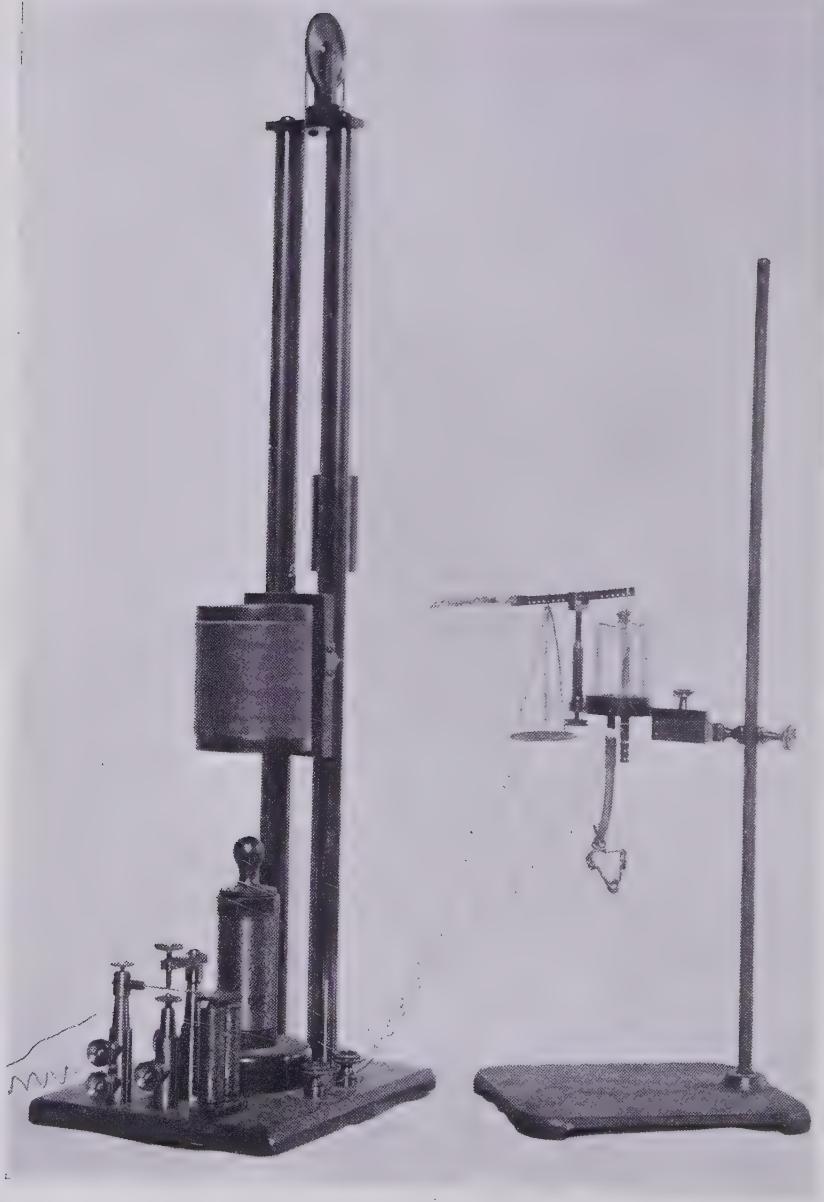


FIG. 7.—Wild muscle-bath.

curve is the record made by the contracting muscle on a very rapidly moving drum (Figs. 5 and 6). Drugs may affect this curve as regards either its height or its length; or, while not affecting the form of the curve of a single muscular contraction, may have a marked effect on the rapidity with which the muscle



FIG. 5.—Tracing of muscle-curve.



FIG. 6.—Tracing of muscle-curve after the administration of veratrine.

becomes fatigued. These changes are studied by means of the Wild muscle-bath. This consists (Fig. 7) of a water-tight glass case which may be filled with either poisoned or unpoisoned physiological salt solution, so arranged that the muscle immersed in the solution may be connected with a lever which records its contractions.

In the foregoing brief account of some of the more important methods of investigating the action of drugs, I have attempted to outline the underlying principles of pharmacological experimentation. As the science of pharmacology progresses and we understand more intimately the effects of drug-forces, new methods must constantly be invented to solve problems which had not before presented themselves. If, however, I have succeeded in fulfilling my hope to make plain at least the principles of pharmacology, a little thought will make these new methods, which are but modifications of old principles, comprehensible even to the busy practitioner who has little time for studying more or less abstract scientific questions. The more the clinician understands the work of the scientist just so much more will he appreciate its utility and be able to make the results of animal experimentation of value to practical medicine, and pharmacology will once more bring therapeutics to its proper position as the most important branch of the art of medicine.

## THE CLIMATE OF NEW ENGLAND.

BY GUY HINSDALE, A.M., M.D.,

Secretary of the American Climatological Association ; Corresponding Fellow of the British Balneological and Climatological Society ; President of the Pennsylvania Society for the Prevention of Tuberculosis, etc.

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THE climate of New England is a peculiarly changeable one. This is due not altogether to its diversity of surface, but rather to its situation with reference to storm tracks. Modern meteorology traces with accuracy the paths of storms,—cyclonic disturbances,—and it is found that the areas of lowest barometric pressure pursue two distinct courses, meeting in New England. Cyclones of the first group come from the Great Lakes, and generally move in a northeasterly direction down the St. Lawrence valley, north of the boundary line, or they may pass more directly east, crossing New England to the Atlantic Ocean. The second group of cyclones comes from the south, and moves in a northeasterly direction along the coast, sometimes within the coast line and at other times in the Atlantic. These are much more severe than the former, and bring a greater amount of rain and snow, but they are fewer in number.

Cyclones should not be confounded with tornadoes. The latter have occurred in New England, but are comparatively rare, pass along narrow paths, and are of intense violence. Cyclones, on the other hand, may pass through or near New England as often, on an average, as once in four days the year round ; they affect a wide extent of territory, and are occasionally, though rarely, attended by loss of life, as at Galveston. The term cyclone may thus be applied to any barometric depression in which a distinct centre of low pressure is formed with the isobars approximately circular, and does not involve the idea of extreme violence of the winds. There are no periods of the year when the cyclones cease to move near New England, though they are somewhat less numerous in summer than in winter. April, May, and October are the months of greatest frequency.

The average annual rainfall is from forty to fifty inches in the

interior to fifty inches on the coast; the amount is subject to a variation of twenty or thirty per cent. The average rainfall is quite evenly distributed in the several months. This is due to the comparative uniformity in the distribution of cyclones throughout the year.

Though New England is a small district, it possesses a diverse topography, and therefore varied climatic conditions. The characteristics of mountain climate are exemplified in Maine, New Hampshire, and Vermont, and those of the sea-level throughout a long and interesting coast. Owing to its remarkable indentations and numerous islands, Maine alone has something like three thousand miles of shore-line.

The New England climate is characterized by its changeableness. During the whole year there are clear days followed quickly by cloudy ones; during the winter and spring there is great variation of high and low temperature. Rain or snow falls in some parts of New England on nine-tenths of the days of the year, and at any given place occurs once in three or four days. The same conditions prevail but for a few days at a time, and there is rarely what is called settled weather. An exception to this must be made in the climate of the Cape Cod peninsula. Here the conditions are much more uniform, and in the islands of Nantucket and Martha's Vineyard the temperature range is remarkably uniform and the winds constant. At these localities a marine climate is experienced. Another striking characteristic is the great range of temperature, both daily and annual. The large daily ranges—of  $10^{\circ}$  to  $20^{\circ}$  F. on the average from the coast inland, and of  $50^{\circ}$  in individual instances—are also due to the rapid succession of cyclones and anticyclones. The large annual ranges— $90^{\circ}$  to  $120^{\circ}$  F.—from the coast inland are due to the fact that the climate is essentially continental, for, while situated on the coast, the weather conditions are brought to it from the west, and are therefore those of a great continent somewhat tempered by the Atlantic Ocean.

The cold of northern New England is constant, but in Massachusetts and Connecticut it is liable to sudden interruptions. Occasional temperatures of  $20^{\circ}$  below zero (F.) in winter, and of  $100^{\circ}$  above in summer, are recorded. The mean average temperature at Boston is about  $48^{\circ}$  F., and is one or more degrees lower in the western counties. Sudden changes are common, and the

passage from winter to summer is often rapid. The climate of the southeastern portion and the two islands is much more equable than that of the interior. The ground sometimes freezes to a depth of three feet, and snow often covers the surface to a depth of two feet or more in winter, especially in the western counties. The average annual rainfall is from forty to forty-five inches.<sup>1</sup> As Charles Dudley Warner says, "New England is the battle-ground of the seasons. It is La Vendée. To conquer it is only to begin the fight. When you have completely subdued, what kind of weather have you? None whatever. It is alternately invaded by the hyperborean legions and the wilting sirens of the tropics." He likens the Gulf Stream to a white knight of the south going up to battle with the giant of the north. The two meet in New England and have it out there. He sarcastically calls New England the "exercise ground of the weather." This may seem rather unfair when all seasons of the year are considered, but one who has spent long winters and springs in southern New England knows very well the exasperating features of the climate. The prolonged, dry, crisp, freezing weather of the north is invigorating; but variable conditions, freezing, thawing, snow melting and freezing again, make nearly half the year dreaded by the healthy, not to speak of its effect on the sick. Warner, speaking from experience, says, "A New Englander is a person who is always just about to be warm and comfortable. That is the stuff of which heroes and martyrs are made!" It is only too true. New Englanders, as far as they are a hardy race and long-lived, are so in spite of the climate. The fittest have survived from generation to generation. They have been brought up in hardship, and show a resisting power very great when their mortality is compared with that of immigrants from foreign lands.

The isothermal lines are roughly parallel with the coast, the mean annual temperature diminishing in a northwestward direction. The difference between the boundaries is about nine degrees F. for four degrees difference in latitude. The daily ranges of temperature are very great at times, especially in winter, and to this may be attributed in large part the prevalence of colds and pulmonary diseases there. The atmospheric humidity varies for the

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<sup>1</sup> Report of the State Board of Health, 1892.

year from sixty to ninety per cent. in different parts of New England. In Boston there is less humidity in spring and early summer than in the other seasons, while at Block Island this is reversed. May and December are the cloudiest months and September is the least cloudy; the average cloudiness is fifty per cent. The number of rainy days each month averages nine to seven.

While cyclones or areas of low pressure advancing towards New England produce marked disturbances of the weather, it must not be forgotten that there is an anticyclone, or area of high barometer, the direct antithesis of the cyclone. The periods of anticyclonic weather are brief, rarely remaining in New England more than two days in succession. Areas of low pressure are sure to take their place. It is during the winter anticyclone that the lowest temperatures are recorded. The air is clear and relatively still; its lowest strata lie very quietly on the earth, especially at night. The nights are long and the days are short, with weak sunshine. The air is dry and inspiriting. The cold of such days is endurable because of the absence of wind and moisture. Under such conditions the lower air becomes extremely cold at night, and thermometers may give readings below zero even near the southern coast, and as low as  $-20^{\circ}$  to  $-40^{\circ}$  F. in northern New England. If comparison at these times be made of the records in adjacent hill and valley stations, it is found that the valleys are much colder than hill-sides and hill-tops, while on peaks the temperature is relatively moderate. On Mount Washington, during such periods of anticyclones, the temperature has been observed at  $+16^{\circ}$  F., while in the neighboring lowlands it ranged from  $-10^{\circ}$  to  $-24^{\circ}$ , a reversal of the usual temperature gradients. This cold at night in lower strata of air in times of anticyclones is, of course, of local production, the cooling of the ground by radiation through the clear air then prevailing, and secondarily to the cooling of the quiet lower air chiefly by conduction, and partly by radiation to the ground.

Such observations are of the greatest practical importance in the choice of building-sites, particularly in mountain regions. Even for summer occupancy houses should never be at the bottom of mountain basins. The lowest portion of the valley first feels the frosts, which in portions of the White Mountains and the Adirondacks may occur even in August. Lakes lying at the base of moun-

tains are in early autumn mornings almost invariably covered with white clouds of fog, which quickly disappear before the sun. Cold air is like cold water,—it seeks the lowest levels; hence it is desirable in choosing a location to seek an eminence or sheltered declivity; such a site is much cooler at mid-day in summer and warmer at midnight in winter than the lower levels. An example of this variation of temperature between the lower and higher levels is seen in the so-called "ice storms." It is probable that in such cases the air half a mile or more above the earth is warmer than that below, and the rain that is formed aloft as a cyclone approaches is cooled close to the freezing-point while falling, and freezes on reaching the ground or any solid object.

Cold waves occur when the cyclone is intense, its passage rapid and central over New England, and when an area of very high pressure lies to the northwest. At these periods of cold northwesterly winds in the lowlands the upper currents are strongest and coldest. On Mount Washington at such times the wind may attain a velocity of over one hundred miles an hour for several days, and temperatures below  $-30^{\circ}$  F. for part of the period. On January 22, 1885, the Mount Washington record showed a minimum of  $-50^{\circ}$  F., the lowest temperature recorded there, and a northwest hurricane of over one hundred miles an hour, the total daily movement being two thousand one hundred and forty miles. At such times the observers on the mountain must have wished for the speedy arrival of the quiet anticyclone with its relative warmth, and it is no wonder that this station has been abandoned.

The typical winter of New England lasts well into March, and after a rapidly warming spring, many days of May are almost like summer. The gales of March and its cold waves have always been characteristic, but never so terrific as on March 11 to 14, 1888, when New England and the Middle States were buried in the "Great Blizzard." The extraordinary features of this storm were the result of two cyclones moving northerly from Arkansas, the northern centre passing northeasterly beyond the New England boundary, while the southern centre passed up the North Atlantic coast. The average depth of unmelted snow exceeded thirty inches, while in Central Connecticut and a large part of Eastern New York the average fall was between forty and fifty inches. The snow was badly drifted by the wind, and drifts from thirty to forty

feet by actual measurement were reported. The snow caused a complete suspension for several days of railway traffic entering New York City; no trains could pass from New York to Philadelphia until the fourth day, and violent winds exceeding fifty miles per hour prevailed. Boston reported a maximum velocity of sixty miles; New Haven sixty; Block Island seventy; and Eastport seventy-two miles per hour. Men were frozen to death in Broadway, New York, and many perished in consequence of exposure. Fortunately, nothing like this has ever been known to have occurred before, and it is extremely unlikely that those now living will ever see such an event again. The great blizzard and cold wave of February, 1899, failed to reach New England, but expended itself in the Mississippi Valley, the Southern and South Atlantic States.

## THE TREATMENT OF ACNE.

A SPECIAL ARTICLE.

BY PROFESSOR H. HALLOPEAU,

Professor Agrégé in Dermatology at the University of Paris; Lecturer on Dermatology at St. Louis Hospital, Paris; General Secretary of the French Society of Dermatology.

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ACNE is a disease that subjects sufferers from it to less serious danger and to more discomfort and annoyance probably than any other pathological condition to which the human race is liable. Simple acne, or acne vulgaris, occurs as cutaneous lesions in association with the sebaceous glands, especially those of the face, the neck, and the upper part of the thorax. Though well known and easily recognized, the disease is but little understood. Its etiology has been a source of much discussion. The cause of the affection is probably not simple, but involves a coördination of a series of factors some of which have been recognized only in recent years. While the general systemic condition of the patient is important, local irritation and the presence of micro-organisms undoubtedly have considerable to do with the initiation and persistence of the disease.

The situations in which acne develops are limited and quite characteristic. The lesions have a marked predilection for the face and the upper part of the thorax. This localization is in itself very typical of the disease and is one of the pathognomonic signs for its diagnosis. Except in cases of menstrual acne the lesions generally follow a downward course. They begin on the forehead and invade successively the nose, especially the lower end of the organ, the cheeks, and finally the chin. It is only after their existence for some time on the face that these eruptions spread still farther downward and occupy the anterior part of the thorax, especially over the sternum, and finally reach the shoulders and interscapular region. The upper part of the arm may also become affected. It is very rare, however, to find acne lesions occupying any other localities than those above mentioned. Portions of the skin where sebaceous

glands do not exist—as, for example, the palmar and plantar surfaces—remain, of course, entirely free from the disease.

In people who are especially subject to acne the skin is apt to have certain characteristic idiosyncrasies. It is inclined to be somewhat thicker, rougher than usual, and more oily. The capillary sebaceous orifices are more conspicuous and more patent. This seems to furnish opportunity for the collection of sebaceous material which often proves the first symptom of beginning acne. These characteristics indicate that acne and the liability to it are individual peculiarities. Such qualities of the skin are prone to exist in certain families, in several generations of which acne may recur.

For the prophylaxis of the disease it is important that persons who have these cutaneous characteristics, and especially those whose direct ancestors have been subject to acne, should be warned to take particular care of the skin. The cuticle should be maintained at its highest point of healthy vitality by frequent bathing in hot water, by massage, and by the careful avoidance of dietary errors or other indiscretions that might lead to the development of acne.

Nearly all acne is preceded by the appearance of comedones, or black-heads. These comedones are concretions which obstruct the openings of the sebaceous glands,—veritable little stoppers in the gland canal. They terminate on the surface of the skin in somewhat rounded heads of a blackish color, whence the familiar name, and within the glands end in thread-like filaments. Sometimes two black-heads are united together in the depths of the tissues; there may even be more than two heads to these multiple comedones. The favorite localities of black-heads are the same as those of acne vulgaris. They may occur, however, in places where acne is never seen, as, for instance, on the eyelids or the lobes of the ears. While they play an important part in the etiology of acne vulgaris, they are thus seen to be not exclusively associated with that affection and they may exist without it.

Just how the presence of the comedo causes the development of acne we do not know. It is probable that the irritation set up by the retained material which acts as a foreign body, causes a chronic inflammatory reaction in the tissues, which weakens the resistive vitality of the cutaneous cells in the neighborhood and so permits the invasion of certain bacilli. We know that various forms

of bacilli are constantly present on the skin and that some of them seem to play an etiological rôle in the development of acne lesions.

The comedo and acne vulgaris have been especially studied from the bacteriological point of view in recent years. Unna, Van Horn, and Sabouraud have added to our knowledge of the conditions in which the disease develops. Unna particularly has found that besides the *Demodex folliculorum*, an ordinary epidermic parasite that has no special pathogenic effect, there exists also in acne lesions a special bacillus. These bacilli do not occur in the comedones where there is no acne, but are found constantly in acne lesions. It is doubtful, however, whether these bacilli are specific for acne, and it is probable that, even if they are, the *Staphylococcus pyogenes albus* and the *Staphylococcus albus butyricus*, described by Sabouraud, are also active agents in the production of the suppurative lesions of eczema.

A number of pyogenic micro-organisms constantly exist on the skin, and it is probable that secondary infections by them frequently occur. Acne, even in its ordinary form, is not a simple condition, and its cause is by no means single or simple. In the treatment, this individuality of the disease in different patients should be especially kept in mind.

There are two principal factors in the production of ordinary acne which are active only in certain individuals, and the general condition of the patient is probably unimportant in inviting and encouraging their activity. One of these factors consists in an alteration of secretion or excretion of the sebaceous matter that is manufactured in certain cutaneous glands and is primarily intended to oil and protect the skin from the inclemencies and variabilities of the weather. The liability of fatty materials to chemical change is well known. The alteration that takes place in the secretion of the sebaceous glands somehow serves to make it a favorable culture medium for the development of certain pathogenic micro-organisms, which represent the other factor in the etiology of the disease. These microbes, that find their way into the sebaceous glands from the patient's surroundings, are probably more abundant and have greater virulence under certain circumstances than under others. It would seem that the orifices of these glands, which are constantly open for the performance of their natural function, are the portals of entry for the infectious agents that grow luxuriantly on the sur-

face of the skin. It is possible that the chemical changes in the sebum itself may have something to do with the production of the acne lesion. Such alterations in fatty materials are apt to produce irritating substances which on certain delicate skins would suffice to produce an inflammatory reaction. This inflammatory process would probably lower resistive vitality and so encourage the growth of micro-organisms that chance to be in the neighborhood.

The diagnosis of acne is never difficult. The site of the lesion is, of itself, a most important diagnostic differential characteristic. There is at times some difficulty in deciding whether acne vulgaris exists alone or is complicated by eczema. Acne occurs not infrequently in seborrhœic patients; for instance, it sometimes accompanies seborrhœic eczema of the hairy scalp. Besides this, seborrhœic eczema may occur on the face and the upper part of the thorax, and thus in several respects resembles acne vulgaris. The most important characteristic in the differential diagnosis of these two conditions is the presence of black-heads; where these cannot be found, it may be almost impossible to make an absolute diagnosis. I have seen cases in which, no black-heads being discoverable, even good authorities disagreed as to whether the condition was true acne or seborrhœic eczema.

For the treatment of acne in general the most important principle is to follow the indications given by the etiology. As the sebaceous material of the skin plays an important rôle in the causation of all forms of acne, the first consideration must always be the regulation of the patient's diet as regards the consumption of fatty material. Whatever may be the direct cause of acne, it can be treated most efficaciously by diminishing as far as possible the production in the organism of the material from which sebum is formed. On the same general principle, spirituous liquors and other stimulating drinks must be greatly limited or positively forbidden, because they exert an evident excitant action upon the sebaceous glands and also upon the circulation in the peripheral capillaries, especially those of the face. It is probable that no method of treatment which neglects the regulation of these two basic factors in the etiology of acne will be successful in eradicating the disease or in causing improvement of the symptoms for more than a brief period.

There is no doubt that disturbances of gastric and intestinal digestion play an important rôle in the production of pathological

conditions on the skin, and especially of such alterations as favor the development and persistence of acne. It is important, then, to prevent as far as possible all fermentative disturbances that may occur during digestion. For this purpose the drugs recommended as intestinal antiseptics are important. Of these the most effective are erythrol, naphtol, and salol, associated or not with charcoal. It has been suggested that, where gastric fermentations are obstinate to ordinary treatment, washing out of the stomach should be practised in patients suffering from persistent acne. This is an extreme measure, however, and not likely to be indicated except in cases of marked dilatation of the stomach in which no other method of treatment would promise to prevent the recurrence of fermentative processes.

But while the general treatment is of the first importance and without it all other means will avail but little, local treatment must form the main part of our therapeutic efforts for the cure of this troublesome disease. In punctate acne we should first of all relieve the orifices of the sebaceous glands of the accumulated secretion which obstructs them. This task is rendered easier by applications which soften the sebaceous material and at the same time remove the accumulation of epidermal cells that has resulted from the sluggishness of gland excretion. For this purpose certain simple remedies are very useful,—*e.g.*, ordinary green soap diluted one-third with alcohol, or potash solutions of from three to five per cent. Salicylic soaps or pastes have in recent years been used with this view, and have proved very satisfactory. Among the remedies that cause cellular desquamation and so assist in freeing the gland orifices a paste of oxide of zinc with resorcin has been recommended. Ichthyol or sulphur paste or ointment is also useful.

Lassar uses a preparation which acts more rapidly; the formula is as follows:

R Beta-naphtol, 10. ( $\frac{3}{3}$  iii);  
Sulph. præcipitat., 50. ( $\frac{3}{3}$  ii);  
Vaseline,  
Sap. virid.,  $\frac{aa}{2}$  25. ( $\frac{3}{3}$  i).

Sig.—Apply externally for fifteen or twenty minutes, but not longer, then wash the skin and powder it with talcum.

This application is repeated a day or two later unless a slight inflammation has occurred in the mean time, but is discontinued as soon as a distinct inflammatory reaction with some reddish brown

color of the skin is noted. As the result of this mild inflammation the horny layer of the skin becomes detached.

Where there are black-heads they must, of course, be removed. The easiest way to do this is by direct mechanical means. They may be pressed out with a little instrument suggested by German dermatologists and known as a comedo-extractor. But a more simple method is to press them into the hollow of a watch-key. The comedo comes out in the form of a thread-like bit of material, black at its head and of a whitish-yellow color where it has been beneath the surface of the skin. The removal of these comedones is of the greatest importance, as it is the irritation caused by their presence in the mouths of the sebaceous glands which gives rise to the alteration in the skin that permits of the invasion of micro-organisms.

In recent years massage has been highly commended for acne. There is no doubt in my mind that this therapeutic measure has proved successful in the treatment of acne just because it prevents the accumulation of material in the sebaceous glands and mechanically assists the skin in removing it. Massage should be practised frequently, morning and evening, the rubbing being done with the fingers covered with some unctuous material. Pospelow, who has particularly recommended massage, advises that the friction be made in the direction of the excretory canals of the sebaceous glands,—that is, from the middle of the forehead towards the temples, from the ears obliquely downward over the cheeks to the chin, from the groove in the upper lip outward towards the cheeks, and around the prominence of the chin in a circular direction from above downward.

Somewhat for the same reason that massage does good, applications of very warm water should be employed. The temperature is an important matter; ordinary warm water as used for bathing will not suffice for this purpose, and the water must literally be as hot as can be borne. It has recently been recommended to apply the hot water by means of cotton in one end of a tube; in this way each acne lesion may be acted upon directly and the effect of the application of heat is more certain. To the hot water may with advantage be added borax or sodium carbonate, or potash, so as to make a solution of about one per cent. The use of a suds made of soft soap—that is, potash soap—has given good results

in some hands. Sulphur soap and ichthyoil soap have also been recommended. Salol soap is now prepared here in France so that it can be used for this purpose. If the comedones are too numerous to be removed one by one, the disfigurement which they produce may be lessened by decolorizing them. This is effected most readily by means of an application of lanolin and hydrogen dioxide or a combination of lanolin and vinegar.

If the skin is delicate or if the patient cannot be induced to use such energetic means as those suggested, less irritating remedies may be prescribed, though their effect is, as a rule, not quite so satisfactory. Certain local applications are useful in the different forms of seborrhœic acne. The best are preparations whose base is some mild irritant, such as sulphur, ichthyoil, naphtol, or thiol. Stronger drugs may be applied in dilute solutions or with large amounts of some indifferent material. The most popular irritants thus employed are carbolic and salicylic acids, resorcin, the mercurials, and ammonium hydrochloride. All of these latter remedies are also parasiticides. They seem to do good in most cases, undoubtedly because they hinder the multiplication of the micro-organisms which play an important rôle in the development of acne.

The more active remedies may be employed as pomades or pastes, as plasters, or in solutions. Of the various fatty materials used as excipients in making pomades vaseline is commonly chosen, or lanolin, and of late years resorbin, eudermin, aleptin, adipatum, and fresh axungia. Some of the formulas that we have found most useful here are the following:

- R Axungiæ recent. benzoinat., 30. ( $\frac{3}{5}$ i);  
Sulph. præcipit. loti,  
Sapon. mollis (potass.),  $\ddot{\text{a}}\ddot{\text{a}}$  5. ( $\frac{3}{5}$ i).  
Fac. pomatum.
- R Lactis sulphuris, 2. to 5. ( $\frac{3}{5}$ ss to  $\frac{3}{5}$ i);  
Potass. carbonat., .2 to 1. (gr. 3 to 15);  
Fac solutionem et adde  
Resorbin, 20. ( $\frac{3}{5}$ v).

Or naphtol may be associated with the sulphur, somewhat as follows:

- R Sapon. virid., 10. ( $\frac{3}{5}$ iiss);  
Axungiæ recent. benzoinat., 30. ( $\frac{3}{5}$ i);  
Lactis sulphuris,  
Beta-naphtol  $\ddot{\text{a}}\ddot{\text{a}}$  5. ( $\frac{3}{5}$ i).

If unguents seem objectionable because of the amount of sebaceous material already present, liquid preparations may be advisable; for example,—

- R Aquæ aurantii flor., 20. ( $\frac{3}{v}$ );  
Alcohol., 30. ( $\frac{3}{i}$ );  
Resorcin., 2. ( $\frac{3}{ss}$ );  
Glycerin., 1. ( $\frac{M}{xv}$ ).

A relatively strong alcoholic solution of sublimate may be prescribed for a patient whose skin is especially tolerant; the possession of this quality must, however, be decided by personal observation in each case. A 1 to 500 solution of sublimate and at times even a 1 to 200 may be used. Pomades containing calomel in the strength of 1 to 40 or 1 to 20 are frequently of benefit. One part of carbolic acid dissolved in fifty parts of glycerin often gives excellent results. Salicylic acid, from two to five per cent. in vaseline or alcohol, is of service especially in obstinate cases.

As a general rule, the proportion of the active agents contained in these diverse formulæ must be modified and eventually decided by the extent of the reaction produced in each patient. Certain preparations which produce scarcely any effect, or at most only a very slight irritation, in most patients may in others give rise to marked inflammation. Whenever more inflammatory reaction than has been anticipated takes place, emollient remedies should be employed for some days, the original application, of course, being omitted and all other sources of irritation avoided as far as possible. Usually oxide of zinc is the best remedy for these factitious inflammations, and, as soon as the irritation has subsided, the former preparation may be once more employed, but in lesser dose than before. These more or less unanticipated exacerbations of the cutaneous conditions resulting from individual susceptibility are annoying, but are often directly followed by distinct and lasting improvement.

There is a method of employing compounds of sulphur which has often seemed to me to be of special service. An ordinary natural sulphur water is placed in a steam atomizer and sprayed upon the tissues. One of the natural waters from the Pyrenees or from Aix in Savoy is the best for this purpose. We have seen this method of treatment cause in a few weeks the almost complete disappearance of an acne vulgaris accompanied by an intense acne rosacea which had for years resisted every other kind of treatment.

The acne rosacea had even been treated on various occasions by scarification and the patient had visited many different watering-places. It would seem that when thus projected against the skin the remedy penetrates more deeply into the cutaneous tissues and so acts more energetically upon the pathological agents contained in them. This opinion is confirmed by the observation of Veiel, who says that preparations in which sulphur comes in contact with the skin in a finely divided spray are very much more active medicinally than are pomades which have sulphur as their basis.

The pigmentation which so often accompanies acne, especially in the neighborhood of the glandular orifices, and which exists even when there are no true comedones, can be effectively treated by a pomade containing fifty per cent. of hydrogen dioxide. Acetic acid is also useful in these cases and may be employed in an aqueous solution of from twenty-five to fifty per cent.

For acne rosacea one of the most effective therapeutic measures is scarification. This is practically the most important remedy for all forms of acne that are accompanied by vascular dilatation, and is best done with Vidal's instrument, as improved by Professor Fournier. One of the drawbacks of this treatment is that it sometimes produces in persons who have a predisposition to the formation of connective tissue a series of distinct cicatrices, which, though not very apparent singly, may because of their number become quite conspicuous. Somewhat of the same nature as scarification is cauterization, by which numerous minute punctures are made with either the galvanocautery or the thermocautery. In this form of treatment also there is a certain amount of danger of the production of scarring or at least of superficial irregularities in the skin that can scarcely fail to be noticeable.

In the so-called acne hypertrophica, in which there is a production of new tissue in the skin, surgical intervention is the only method by which relief can be afforded. The operation known as decortication of the nose (for it is this organ that is most frequently the seat of the hypertrophic process) may produce a very satisfactory modification in the appearance of patients thus afflicted. We have at the St. Louis Hospital a number of models in the museum which show remarkable specimens of hypertrophic acne, and also demonstrate how much can be done for the relief of the extremely disfiguring condition.

The prognosis of acne is supposed to be always good, at least as regards life. It must not be forgotten, however, that death has been directly traced to an acne lesion. In these extremely rare fatal cases the suppurative process in a spot of acne vulgaris became the point of origin for a thrombosis of the ophthalmic vein and this infective condition spread to the cavernous sinus.

The prognosis of acne *quoad durationem* is one of the most difficult problems in medicine. At certain times in life the slightest digestive disturbance may give rise to an acne that only the most careful treatment over a long period will cure. Slight indiscretions in diet are sometimes sufficient to produce an outbreak. It is always impossible to tell whether any set of remedies will in the individual case prove successful either in cutting short a present attack or in preventing relapses. The disease is often extremely obstinate, and only the most careful observation and individualization of treatment will give satisfactory results.

A form of acne that causes great annoyance and is very obstinate in its successive relapses for long periods is the eruption which sometimes accompanies menstruation. It can usually be distinguished from ordinary acne by its location. Acne vulgaris commonly begins on the forehead and invades the rest of the face gradually, always going lower and lower. It attacks the cheeks and the nose before it reaches the chin. Menstrual acne, on the contrary, generally attacks first of all the chin and the lips, confining itself pretty closely to the portions of tissue surrounding the oral opening. It is characterized by distinct exacerbation during the menstrual period.

Menstrual acne often demands special treatment. We have found emmenagogues, such as apiol or the tincture of hamamelis, of service. Often, however, it will be found that the outbreaks are associated with some menstrual disturbance due to a pathological condition that may need gynaecological treatment. At times the history of the case will show that the attacks are accompanied by constipation and that the menstrual disorder and the acne are both dependent on the irregularity of intestinal function. The symptomatic exacerbations that occur are then only the index of lowered systemic vitality at a time when special calls are made upon the nervous force of the organism. The primary indication in these cases is the cure of the constipation.

## PRACTICAL HINTS.

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### CITRIC ACID FOR OZÆNA.

IN ozæna the main symptom is the odor. This is not only disgusting to others, but often takes away the patient's appetite and so induces general ill health. Citric acid is recommended for the purpose of removing the odor. It can be used either alone in powder or mixed with equal parts of sugar and milk. The nose is thoroughly cleansed in the morning and then insufflated with the powder; the insufflations are repeated, if necessary, at noon and in the evening. The deodorizing effect is said to continue for several days, though the constant use of the remedy will probably be necessary in most cases. The citric acid is not only a deodorizer, but has also a certain sedative and antiseptic effect on the chronic inflammatory process.

### TUBERCULOUS PERITONITIS.

Recent articles<sup>1</sup> show that surgeons have lost all hope of benefiting cases of tuberculous peritonitis by free incision of the abdomen. The conclusion of a recent paper in the *Annals of Surgery* is to the effect that surgeons can be thankful for having had a justifiable opportunity to examine tuberculous peritonitis by direct vision, but that now they should hand these cases over to the medical man. Time is the main element in the treatment. Improvement in the general condition of the patient invariably leads to lessening of the tuberculous peritonitis. Cases of simple tuberculous ascites, without complicating lesions in other parts of the body, have a reasonably good prognosis.

The medical treatment of tuberculous peritonitis was summed up recently by Burney Yeo. He has seen good results follow the internal administration of one-fourth of a grain of iodoform and half a minim of creosote three or four times a day. He believes that external applications to the abdomen are also of distinct benefit. He suggests the following prescription:

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<sup>1</sup> *Annals of Surgery* and Volkmann's *Vorträge*.

R Ung. iodoformi (10 per cent.),  
Olei morrhuae,  $\frac{aa}{3}$  i.

Sig.—For external application to abdomen twice a day.

The best results are obtained in early stages of the disease and in cases where there is more or less ascitic fluid. In advanced chronic cases with infiltration of the coats of the intestines and adhesions of the bowels, besides large caseous mesenteric glands, no treatment promises to be of much avail. Iodoform rubbed into the skin of young patients, however, rapidly enters the circulation. It is eliminated shortly after inunction, and may be detected in the secretions and especially in those of the serous membrane. There is no doubt, then, that in an active form iodoform and its derivatives reach the actual site of the tubercular deposit.

#### WHOOPING-COUGH.

The main indication in this disease is to make the spasms of cough less severe, so as to prevent inanition from vomiting and the other accidents which occur as the result of the paroxysm. Bamberger suggests the following remedy, to be given just as the attack of cough comes on.

R Sodii bicarb.,  
Sacchari,  $\frac{aa}{3}$  ii.

Dissolve the powder in hot water, keep the solution as hot as can be borne, and give sips of it as the paroxysm comes on.

#### PROPHYLAXIS OF GASTRIC ULCER.

Attention has recently been called to the fact that gastric ulcer develops with special frequency in certain occupations and that anaemic individuals who follow these occupations should be warned of the special dangers involved. Anaemic cooks, for instance, should be warned of the danger of tasting very hot food, anaemic seamstresses should be warned not to lean against their machines, especially when in vibration, because there seems no doubt that through thin abdominal walls an anaemic mucous membrane may under these conditions suffer from a sort of decubital ulcer. This is also true for factory operatives. Shop-girls, book-keepers, and typewriters should be warned not to lean against counters and desks for nearly the same reason.

#### THYROID MEDICATION.

Because of the possibility of its successful application to a number of conditions other than myxoedema, thyroid treatment has

received considerable attention of late. French observers report wonderfully successful results in infantilism, or under-development, due to almost any cause. The thyroid function may have been impaired by congenital syphilis, by tuberculosis, or by rhachitis; as a result, failure of development either in some part of the body or of the whole body occurs. The administration of thyroid material will partially make up for the developmental failure due to diminution of thyroid secretion. Arrested development of the sexual organs, for instance, is now considered an indication for thyroid treatment. Haemophilia is looked upon as a failure of blood-making organs to develop and their development may be assisted by thyroid treatment. Scleroderma is another affection that is benefited by thyroids. Even chronic rheumatism and tetany seem in some cases to be dependent upon functional disorder in this gland.

Functional thyroidism has attracted no little attention recently. Dr. Perry presented before the Harvard Medical Society of New York a series of cases in which the underlying condition seemed to be diminution of the thyroid gland. Four symptoms are constant in all the cases,—a painful condition of the joints, resembling the neuroarthropathy described by the late Professor Charcot; headache, likely to be continuous but with acute exacerbations; a weak and rapid heart with tendencies to paroxysmal tachycardia; and in women a distinct tendency to menorrhagia. In all of Perry's cases the usual depression above the sternum was obliterated, as if there were enlargement of the lower median portion of the thyroid gland; in none of them, however, was there any true goitre nor any prominence of the eyeballs. In all of the cases the condition developed as the result of severe fright or intense emotional strain. Perry saw cases occur in three generations of the same family. The symptomatic condition was rapidly improved by the administration of from ten to twenty grains of thyroid extract per day. The patients developed no intolerance for the remedy, though thyroid extract is not well borne by normal persons. In one of the cases the dose had to be reduced to one-half grain three times a day at the beginning, for there were marked symptoms of tachycardia and weakness. In an infant whose mother had suffered from symptoms that were relieved by thyroid extract, a pasty condition of the cutaneous tissues disappeared under the use of about two grains of thyroid extract per day.

## INFUSION IN GENERAL PRACTICE.

The use of subcutaneous infusions of salt solution is considered to be vindicated in many other morbid conditions besides hemorrhage. It is considered a prophylactic in placenta prævia, in which condition it is said to render narcosis more prompt and version for rapid delivery easier. It is indicated, of course, in the hemorrhage of typhoid fever and in bleeding after the rupture of tubal pregnancy or from acute abdominal injury. In acute and chronic diarrhoeas, in the very acute gastro-enteritis that sometimes quickly carries off adults, in the severe summer cholera of children, and in marasmus due to chronic intestinal trouble, it has given better satisfaction than any other method of treatment. Some time ago Georgii recommended the addition of three per cent. of sugar to the normal salt solution for these cases of marasmus, and excellent reports from its use have come from paediatric clinics. In poisoning from strychnine, chlorate of potassium, illuminating gas, or iodofrom it dilutes the poison in the blood and promotes elimination. In these cases venesection should precede or be associated with the saline infusion. In uræmia the process of washing out the blood—that is, venesection followed by the injection of salt solution, repeated after a few hours—is the best remedy known. It has been suggested that in phosphorus poisoning, so often a hopeless condition, turpentine water shall be added to the salt solution.

## MYASTHENIA GRAVIS AND POLYORRHOMENITIS.

These are the long names of two pathological conditions that by many clinicians are considered to have sufficient symptomatic independence to deserve special consideration by themselves. Hence a number of text-books recently have introduced them under special headings.

*Myasthenia gravis* is the name which has been given to a group of symptoms which closely resemble those of bulbar paralysis, but which, though often fatal, have not so far been traced to any visible lesion of the nervous system. The characteristic feature of the disease is weakness of the voluntary muscles, which are very rapidly exhausted by exertion but recover their power often after even a brief rest. In severe cases and after the symptoms have continued for some time, muscular weakness persists in spite of rest. The

muscles most frequently involved are those of the eyes, head, and neck, so that the patient has ptosis, diplopia, immobility of the face, difficulty of swallowing, defective articulation, and inability to support the head upright. Nearly all the muscles in the body may be affected. Dr. Taylor, of Guy's Hospital, in his "Practice of Medicine," says that no treatment can be relied upon. Rest, warmth, and tonics have a favorable influence.

*Polyorrhomenitis* (from the Greek word *σπρός*, which means serum) is a synonym for polyserositis, and the two names are given almost indifferently to the condition of simultaneous inflammation of two or more of the four great serous membranes,—pericardium, pleuræ, and peritoneum. The tendency to association of inflammation of these membranes has been especially pointed out by Italian writers. Acute polyorrhomenitis occurs in acute rheumatism, in pyæmia and septicæmia, and as a result of a generalized invasion of the tissues by the pneumococcus. The peritoneum is usually first attacked and then the pleuræ, the right pleura suffering, as a rule, before the pleuritic membrane on the left. The only treatment of the condition is the general support of the system and such surgical measures as may seem advisable. The prognosis in this combination of serous pathological conditions is much worse than when only one of the serous membranes is attacked.

# Medicine

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## ON THE SIGNIFICANCE OF BASOPHILIC GRANULES IN RED CORPUSCLES, WITH SPECIAL REFERENCE TO THEIR OCCURRENCE IN CHRONIC LEAD POI- SONING.

BY CHARLES E. SIMON, M.D.,

Baltimore, Md.

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THE occurrence of basophilic granules in red blood-corpuses, which has of late attracted much attention among workers in the clinical laboratory, was first observed, in cases of malaria, by Marchiafava and Celli.<sup>1</sup> In many of the red cells they found small round bodies resembling micrococci, which took up methylene blue and which they suspected, in some instances at least, to be parasitic (coccii). They pictured these granules in Plate II., which accompanied their first communication, and it is seen that in some cells their presence is associated with that of the plasmodia. Later, however, they recognized that these granules have nothing whatever to do with the malarial parasite, and in a communication by Celli and Guarnieri<sup>2</sup> it is stated that they also occur in *morbus maculosus Werlhofii*, in measles, scarlatina, smallpox, typhoid fever, various forms of anaemia, pneumonia, etc., and that they may indeed be present in the blood of apparently healthy individuals.

Still earlier than Marchiafava and Celli, Ehrlich had apparently seen these granules, but a published statement to this effect did not appear until 1885.<sup>3</sup> He speaks of the phenomenon as "methyleneblaue Entartung" (methylene-blue degeneration), in consequence of which the stroma of the red corpuscles, or por-

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<sup>1</sup> Marchiafava and Celli, *Atti della R. Accademia dei Lincei*, 1884.

<sup>2</sup> A. Celli and E. Guarnieri, *Ueber die Aetiologie d. Malariainfektion, Fortschritte d. Med.*, 1889, vol. vii. p. 523.

<sup>3</sup> P. Ehrlich, *Zur Physiologie u. Pathologie d. Blutscheiben*, *Charité-Annalen*, 1884, vol. x. Reprinted in the "Farbenanalytische Untersuchungen," by the same author, Berlin, 1891, p. 49.

tions of the stroma, take on a diffuse bluish stain, while at the same time more intensely dark-blue granules are seen. Ehrlich states that he observed this phenomenon in the most divers diseases, and with especial frequency in cases of severe anaemia. He regards the condition as possibly identical with the so-called anaemic or polychromatophilic degeneration of the red cells, and both as referable to a senescence of the stroma in consequence of some impairment of nutrition.

A few years after Ehrlich (1888), Foà<sup>1</sup> reported that he also had observed very small blue granules in red corpuscles after staining with methylene blue, which either occurred in the centre of the cells or formed a circle in the periphery. According to Foà and Mondino<sup>2</sup> they represent remnants of nuclear substance.

In 1891 Wertheim<sup>3</sup> reported that he found such granules in the blood of leukæmia (fourteen cases), and he apparently associates their presence with the occurrence of karyokinetic changes in the nucleated red cells. He states that they are colored by methylene blue, but may also be recognized in unstained preparations or in specimens that have been colored with aurantia, where they appear "very distinctly" as little dark spots. They mostly disappear after the completion of the karyokinetic process, but frequently persist. He adds that in nucleated red cells the nucleus of which is breaking down, as also in non-nucleated cells, they are often very well marked. He refers to similar observations by Erb (especially in the blood of pernicious anaemia), but, unfortunately, gives no reference, so that I was unable to look up the original paper. His observations in leukæmia are illustrated by a very fair plate.

After this the occurrence of the granules apparently received no further attention until 1893, when Askanazi<sup>4</sup> reported their presence in a severe case of pernicious anaemia. He writes as follows: "In specimens stained with Plehn's solution the violet-colored red corpuscles (owing to polychromatophilic degeneration)

<sup>1</sup> Foà, Atti del 12° Cong. dell' Associazione Medica Italiana, Pavia, 1888.

<sup>2</sup> Mondino, Giorn. di scienze naturali, etc., Palermo, 1888, vol. xix.

<sup>3</sup> E. Wertheim, Z. Frage d. Blutbildung b. Leukaemie, Zeitsch. f. Heilkunde, 1891, vol. xii. p. 306.

<sup>4</sup> S. Askanazi, Ueber einen interessanten Blutbefund bei rapid letal verlaufender perniciöser Anaemie, Zeitsch. f. klin. Med., 1893, vol. xxiii. pp. 83 and 85.

often showed an exceedingly fine, faintly blue granulation, which at times was so minute that it was hardly noticeable on superficial examination, the cell merely presenting a violet coloration. On careful focussing, however, the blue granules were seen in intimate contact with each other." He adds that he found the same granulations in "the violet-colored" red corpuscles in cases of leukaemia and secondary anaemia after staining according to Plehn's method. Askanazi's paper is accompanied by an excellent plate (No. II.), which illustrates the occurrence of the granules in question in non-nucleated as well as in nucleated red cells and in polychromatophilic as well as in normally colored corpuscles. Both normoblasts and megaloblasts were manifestly affected, and it is noteworthy that in two nucleated cells in which mitosis was occurring the protoplasm was studded with blue granules. Their occurrence in apparently normal red cells Askanazi has certainly misinterpreted, as he describes these cells as normoblasts filled with nuclear fragments. He probably failed to recognize the identity of these "fragments" with the common granules, as he supposed the latter to occur only in polychromatophilic cells. To one who has frequently seen the granules in question, however, it is perfectly clear from the illustrations that the fine granules in the polychromatic cells and the coarser granules in the otherwise normal cells are in reality identical. Askanazi pictures nothing whatever that could possibly be interpreted as suggesting a process of karyorhexis. Of interest is his statement that he could not observe a similar breaking up of the nuclei of megaloblasts, although in rare cases a few isolated (one to three) very small round nuclear particles were seen beside the large round nucleus. But, as I have said, he pictures megaloblasts in which the protoplasm is studded with granules of the small variety.

In 1894 Schaumann<sup>1</sup> records their presence in cases of bothriocephalus anaemia, of which he had occasion to examine a large number. He states that, like Askanazi, he was able to observe that a number of the polychromatophilic red cells manifested a finely granular or punctate appearance. Of special interest is the fact that, as in Askanazi's case, such granules were found in nucleated cells which were undergoing karyokinesis. Plates accompany the

<sup>1</sup> O. Schaumann, Z. Kenntniss d. sogenannten Bothriocephalus-Anaemie, Akadem. Abhandl. Helsingfors, 1894.

monograph, in which the granular appearance of the red cells is very imperfectly shown.

Following these observations two years elapsed before a further note appeared on their occurrence. Lazarus<sup>1</sup> then demonstrated the granules, at a meeting of the Verein für innere Medicin in Berlin, in a case of pernicious anaemia, and announced that he had found such granules in every case of the kind (more than twenty) that he had occasion to examine. He states that only in a few cases are they so numerous as to attract attention on superficial examination, while, as a general rule, a careful search is necessary. They were more commonly found in megaloblasts than in normoblasts, but were present also in cells which presented an "entirely normal protoplasm." In addition to the cases of pernicious anaemia he only found the granules in a case of myelogenous leukaemia. In other diseases, and notably in the severe secondary forms of anaemia, such as those associated with carcinomatosis and syphilis, and in cases of acute traumatic anaemia, he never found anything similar, and in healthy individuals also they could not be demonstrated. The specimens were stained with Chenzinsky's solution for from six to twenty-four hours. Lazarus regards the presence of the granules as evidence of karyorhexis,—as a degeneration product of the nucleus. Of special interest is his observation that the granules may persist in the blood of pernicious anaemia even during the period of apparent convalescence, and may be demonstrable at a time when the blood picture is otherwise fairly normal. He refers to a dissertation from Gerhardt's clinic, prepared under v. Noorden's guidance, in which similar appearances were described.<sup>2</sup>

In the same year Klein<sup>3</sup> also announced the discovery of such granules in three additional cases of pernicious anaemia. He states that on staining with eosin and methylene blue the haemoglobin of the megaloblasts was colored a grayish-violet, and that on careful examination it was found that the violet color was referable to the presence of a large number of very fine blue granules which lay embedded in the protoplasm. The same appearance was noted in most of the non-nucleated poikilocytes. In small cells they were coarser and the individual granules then appeared to have flat-

<sup>1</sup> A. Lazarus, *Deutsch. med. Woch.*, 1896, vol. xxii., V. B. p. 105.

<sup>2</sup> See v. Noorden, *Charité-Annalen*, 1892, vol. xvii.

<sup>3</sup> Klein, *Wien. med. Presse*, 1896, p. 922.

tened contours. Of special interest is the observation that with an improvement in the general condition of the patients the granules gradually disappeared from the megaloblasts, while at the same time the number of the non-nucleated granule-cells diminished. Klein manifestly associates the appearance of the granules with the polychromatophilia of the red cells, and is inclined to regard the phenomenon as evidence of an immature condition and not as a degenerative change.

Following these communications the only additional paper which deals with the granules under consideration from a clinical standpoint, prior to 1899, is one by Zenoni,<sup>1</sup> who records that he found such granular cells in a case of pernicious anæmia.

A review of the work done up to this time shows that, while the existence of basophilic granules in red blood-corpuscles was known, the subject had received comparatively little attention, and a systematic study of their occurrence in other diseases besides pernicious anæmia was still wanting. Ehrlich, to be sure, states that he found the granules in question "in the most diverse diseases," but he gives no details; Lazarus, on the other hand, mentions that outside of his twenty-odd cases of pernicious anæmia and the one case of leukæmia he never saw the granules in any other disease. In 1899, however, the study of the subject received a new impetus through the researches of Plehn.<sup>2</sup> In a communication to the Berliner med. Gesellschaft, he announced that in the blood of both Europeans and negroes of the district of Kammerun (West Africa) he had observed the occurrence of granules which on staining with Ehrlich's haematoxylin-eosin were colored a dark blue. He terms these "karyochromatophilic" granules and regards them as "ground forms" of the malarial organism. A careful analysis of his work, however, makes it quite clear that Plehn was dealing with the same basophilic granules which had been previously described by Ehrlich, Askanazi, and Lazarus, and which a number of years previously Marchiafava and Celli also had mistaken for parasites of malaria.

Plehn gives an excellent description of the granules and has made a careful study of their relation to malarial fever. He states

<sup>1</sup> C. Zenoni, Delle alterazioni degenerative degli eritroblasti nell'anemia perniciosa, Il Policlinico, 1898, vol. v. p. 33 (Sezioné Medica).

<sup>2</sup> A. Plehn, Ueber Tropenanaemie u. ihre Beziehungen z. latenten u. manifesteren Malariainfektion, Deutsch. med. Woch., 1899, Nos. 28, 29, and 30.

that they are quite commonly found in the blood at a time when no plasmodia are present and while the individuals are absolutely free from chills. As he says, they may be present for weeks and even months before the first attack. Of special interest is the observation that the number and size of the granules may increase with an improvement of the general anaemia, while blood destruction appears to be associated with a corresponding diminution. In cases of acute malaria which have not been treated with quinine, and in which as a consequence the fever continues for a number of days, the granules may disappear almost entirely. On the other hand, they may persist in the blood for months and years after the last attack of fever, and after the individual has removed from the malarial district. Outside of Kamerun, Plehn observed such granules in the blood of inhabitants of the malarial region about Rome and in the case of sailors who had been exposed to tropical fever districts "both in those who had had and those who had not had malaria." He adds that in the case of the latter, as in those of the Roman Campagna, the granules were far less numerous and much smaller than in settlers of the western coast of Africa.

According to Plehn, the peculiar type of anaemia which so commonly develops, in Europeans especially, even after a very brief sojourn in the tropics, is referable to a latent form of malaria, as shown by the presence in the blood of these "ground forms" of the malarial parasite. But, as I have already pointed out, there is no basis whatever for the assumption that these "ground forms" represent anything else than the basophilic granules which had already been noted in the blood by Ehrlich, Lazarus, Askanazi, and others. Plehn's observations attracted much attention; through his researches no doubt the impetus was given to much valuable work. The most painstaking observations on the occurrence of the granules under the most divers conditions which have since been published are those of Grawitz<sup>1</sup> and his assistant Hamel.<sup>2</sup>

<sup>1</sup> E. Grawitz, Ueber körnige Degeneration d. rothen Blutzellen, *Deutsch. med. Woch.*, 1899, vol. xxv. p. 585; *Berlin. klin. Woch.*, 1900, p. 181. Idem, Granular Degeneration of the Erythrocytes, and its Significance in Clinical Pathology, *Amer. Journ. Med. Sci.*, 1900, vol. cxx. p. 277.

<sup>2</sup> Hamel, Ueber die Beziehungen d. körnigen Degenerationen d. rothen Blutkörperchen z. d. sonstigen morphologischen Veränderungen d. Blutes, mit besonderer Berücksichtigung d. Bleiintoxikation, *Deutsch. Arch. f. klin. Med.*, 1900, vol. lxvii. p. 357.

Grawitz regards the presence of the granules in red cells as evidence of a peculiar form of degeneration,—what he terms “granular degeneration,”—and states that they are only found in those morbid conditions in which a degeneration of the blood-cells may be assumed to occur. He insists that the phenomenon has nothing to do with the appearance in the red cells of products of disintegration of the nucleus, nor should it be regarded as a phase of polychromatophilic degeneration. He believes that “granular degeneration” takes place in the red cells of the circulating blood as a result of the activity of different blood-poisons, and that in this way a peculiar reaction of the cell protoplasm is produced. This may be brought about by different causes, and it follows that the occurrence of this sign of degeneration in the blood is of no simple significance. It admits of but one general conclusion,—viz., that it is the result of the action of deleterious substances upon the blood. Positive results were obtained:

1. In chronic lead poisoning. Grawitz states that in more than thirty cases granule-cells were found in every instance, and it is noteworthy that they were present even when no other morphological changes could be demonstrated in the blood and at times when no other clinical symptoms of lead poisoning existed. Scattered granule-cells were thus seen in the blood of several painters who were under treatment for some other illness and who showed no other sign of saturnism. He suggests that in a state of coma especially the finding of numerous granule-cells may be of marked value in the diagnosis of saturnine encephalopathy, as they apparently do not occur in uncomplicated cases of either diabetic or uræmic coma. After from four to six weeks' treatment the granules usually disappear from the blood, so that it is possible to control the effect of any therapeutic measures that may have been instituted.

2. In pernicious anaemia. Granular degeneration of the red corpuscles is here found in especially marked degree, and it was noted that, as in chronic lead poisoning, improvement in the general condition of the patient was associated with a diminution in the number of the granules, which even disappeared altogether, while with a change for the worse their number again increased. Grawitz states that the granule-cells are also found in leukæmia and Hodgkin's disease in the later stages. In chlorosis, on the other hand,

they are absent so long as the disease is uncomplicated by marked intestinal disturbances (constipation and coincident autointoxication).

3. Positive results were obtained in carcinoma, especially when the position and nature of the tumor were such that the poisonous products of the cancerous process could easily be absorbed (carcinoma of the stomach and intestines).

4. In septic conditions granule-cells were often found. Grawitz expresses the opinion that negative results, when constantly observed in suspected septic conditions, are of similar value in diagnosis, as their absence would admit of the conclusion that in such cases no direct blood-poison is produced.

5. In malaria the granule-cells were frequently found.

Negative results were generally obtained in tuberculosis, even in advanced stages, so long as a cachectic state had not developed as the result of a general septic infection. It is further noteworthy that no granule-cells were found in syphilis, either in the primary or later stages, and that the administration of mercury does not lead to their appearance. Similar results were obtained in chronic liver disease, diabetes, typhoid fever, pneumonia, diphtheria, etc.; but a few isolated granule-cells were occasionally observed in chronic nephritis when associated with intense anaemia, in extreme rickets, and in one case of severe anaemia following hemorrhage from the stomach.

Very soon after the publication of Grawitz's first paper a further communication on the subject was made by Litten,<sup>1</sup> who reports that he found the granules in question in nine cases of anaemia. Four of these were of the pernicious type, three followed hemorrhages (ulcer of the stomach, typhoid fever, and carcinoma of the uterus), while one case was associated with well-advanced carcinomatous cachexia, and the last occurred in a case of chlorosis of moderate severity. The granules were found in all forms of red corpuscles,—viz., in nucleated (normoblasts and megaloblasts) and in non-nucleated cells (megalocytes, microcytes, and poikilocytes), in apparently normal red corpuscles, as also in such showing evidence of polychromatophilic degeneration. At first Litten

<sup>1</sup> M. Litten, Ueber basophile Körnungen in rothen Blutkörperchen, Deutsch. med. Woch., 1899, vol. xxv. p. 717.

also inclined to the view of Grawitz that granular degeneration has nothing whatever to do with nuclear disintegration, but later he partly abandoned this stand-point after he had observed that in one case of pernicious anaemia red cells undergoing karyolytic changes were found in large numbers in the bone-marrow, while similar appearances were noted in the blood. I must confess, however, that I do not see the strength of Litten's argument. For, even though it were possible that karyorhexia may be completed in the circulating blood in isolated cases, it does not necessarily follow that the coarse and irregular fragments which are then seen have anything to do with the granules in question. Litten regards with suspicion certain cells in which coarse blue granules were found in such abundance as to obscure the cellular protoplasm. He states that Askanazi also saw such cells and pictured them. I have accordingly looked at the cells to which Litten refers, and must confess that I did not find a specially uncommon appearance. However, as Litten had then observed only nine cases in which the granules in question were present, it is quite possible that he was not altogether familiar with the varying appearances which such cells may present.

In the discussion at the meeting of the Verein für innere Medicin, which followed the presentation of Litten's paper, additional observations on the occurrence of the granule-cells were recorded by Behrend, Strauss, Bloch, and Ullmann. The clinical observations of these gentlemen are in brief the following.

Behrend<sup>1</sup> records that he found granule-cells in pernicious anaemia and in six cases of "lead anaemia." He thinks that the number of affected cells stands in a direct proportion to the intensity of the intestinal symptoms and cites cases in support of this view.

Strauss<sup>2</sup> found the granules in twenty-seven cases of anaemia out of seventy,—viz., in four cases of pernicious anaemia, in twelve cases of carcinoma, in one each of puerperal sepsis, anaemia associated with tuberculosis, following dysentery, nephritis, and abortion, in one case of severe idiopathic anaemia, in two cases of mixed leukæmia, and in one each of chronic lead poisoning, acute atropin

<sup>1</sup> Behrend, Deutsch. med. Woch., 1899, vol. xxv. p. 254.

<sup>2</sup> Strauss, ibid., V. B. p. 268.

poisoning, and of atrophic cirrhosis of the liver associated with delirium tremens. In addition they were seen in one case of chronic articular rheumatism in the absence of anaemia and in a supposedly normal individual.

Bloch<sup>1</sup> states that he found granule-cells in ten cases of pernicious anaemia, but that he has seen cases of the disease also in which they were absent. Like Grawitz, he obtained positive results in cases of sepsis and carcinoma, but he asserts that he found them in the secondary anaemia of tuberculosis and syphilis. They were present in three cases of leukaemia (one possibly a case of v. Jaksch's pseudoleukaemia), in young children in association with severe rickets, in congenital syphilis, and in atrophic infants. They were seen also in post-hemorrhagic anaemia (ulcer of the stomach, abortion). In chlorosis, in two cases of hemorrhagic diathesis of unknown origin, and in healthy individuals they were not found. They were seen in eight cases of lead poisoning out of eleven, and Bloch states that, while he also found the cells most numerous in association with intestinal symptoms, this is not necessarily the case, and that he has seen cases with severe intestinal symptoms in which the cells were not found (!). In a number of cases of poisoning with sulphuric acid, mercury, and potassium chlorate no granule-cells were found. Bloch finally cites four cases of malaria, in three of which a positive result was obtained. Like Grawitz, Bloch does not regard the granules as having resulted from nuclear material through a process of karyorhexis, but apparently inclines to the view that they are referable to some change in the haemoglobin.

Ullmann<sup>2</sup> claims (certainly without adequate reason) that granule-cells may at times be found in the blood of normal individuals, and it appears that he looks upon the process as a degenerative change occurring in the protoplasm of the red cells after the blood has been shed.

At the conclusion of the discussion, Litten finally announced that he found granule-cells in three additional cases of severe anaemia and in one case of lead poisoning.

The most recent contribution to the subject under consideration

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<sup>1</sup> Strauss, *Deutsch. med. Woch.*, 1899, vol. xxv. p. 279.

<sup>2</sup> *Ibid.*, p. 281.

is that of White and Pepper.<sup>1</sup> Their paper deals more especially with the occurrence of the granule-cells in cases of chronic lead poisoning, in lead-workers without subjective symptoms, and in heat cases. There is added an account of a series of experiments on lead poisoning in dogs. The results which were obtained are in brief the following:

1. Of four cases, which came to the hospital with marked and typical symptoms of chronic lead poisoning, the granules were present in all. In the severest cases the coarser granules were slightly in excess over the fine ones. Normoblasts were seen, and the majority of them showed the granular degeneration, while the nuclei appeared to be intact.

2. Of the lead-workers without subjective symptoms the granules were found in all. The number of granule-cells in these cases varied from a few in a spread (cover-glass) to as many as two or three in a field. In five of these cases normoblasts were seen, most of them with granules, while the nucleus appeared to be unchanged. Two of the men in whom the granules were found had worked only four days, and it is noteworthy that in both cases one cell with granules was found in every four or five fields.

3. Of the eight heat cases which were examined (four were iron-workers at furnaces and four were patients receiving local dry hot-air treatment) granule-cells were found in only one (an iron-worker). But the writers conclude that in this case the positive result may have been referable to the diarrhoea which the patient had had for twenty years, or possibly to lead "which he not unlikely had received during a prolonged course of treatment."

To the experimental work of White and Pepper, which was carried out on dogs, I shall have occasion to refer later on.

#### PERSONAL OBSERVATIONS.

*Technic.*—My personal observations on the occurrence of basophilic granules in red corpuscles now extend over a period of three years. During this time I have used the eosinate of methylene blue (the so-called Jenner's stain) as routine blood-stain in my laboratory, and accordingly do not think that I overlooked the

<sup>1</sup> C. Y. White and W. Pepper, Granular Degeneration of the Erythrocytes, Amer. Journ. Med. Sci., 1901, vol. cxxii. p. 266.

presence of granule-cells in many cases. I have elsewhere drawn attention to the great value of this stain as a thoroughly practical and well-differentiating blood-stain, and have pointed out before that it readily colors the granules in question.<sup>1</sup> Its preparation is a simple matter; it keeps practically indefinitely; previous fixation by heat or immersion of the specimen in alcohol, alcohol and ether, or by treating with formol, etc., is unnecessary, and the stain itself has even more decided polychromatic properties than Ehrlich's stain, which has for so many years ranked as the most useful differentiating stain in the clinical laboratory. As many workers are still unfamiliar with its use, I will briefly describe its preparation and the simple technic of staining blood-films. The latter, as I have also pointed out elsewhere, I now prepare on slides. A fair-sized drop of blood, obtained from the finger or the ear, is mounted near one end of the slide, and is spread out by the aid of the edge of a second slide, with a single sweep, undue pressure being carefully avoided. The thickness of the layer can be well regulated by inclining the second slide to an acute angle or by raising it nearly to a right angle with the one carrying the blood. Very little practice indeed is necessary to obtain quite satisfactory results. The specimens are allowed to dry in the air and can then be stained directly without special fixation.

The stain is prepared as follows: equal parts of a 1.2 to 1.25 per cent. aqueous solution of Grüber's eosin (yellow shade) and of a one per cent. aqueous solution of methylene blue are mixed in an open basin, thoroughly stirred, and set aside for twenty-four hours. The resulting precipitate is collected on a filter, dried, powdered, washed with water, again collected and dried, and can then be stored for future use. Of the dye which has thus been prepared, an 0.5 per cent. solution in pure methyl alcohol (absolute best) serves as a stain. It is ready for use almost immediately after its preparation, and, as I have already said, is perfectly stable.

The specimens are stained for from three to five minutes by thoroughly covering the slide with the solution. The stain is then washed off, when the preparations are well dried in the air (not with filter-paper) and are now ready for examination. Viewed with

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<sup>1</sup> C. E. Simon, Eosinate of Methylene Blue, Maryland Med. Journ., April, 1900.

the naked eye the blood-films present a dirty rose-color, unless the leucocytes should be very numerous or several days have elapsed between the preparation of the smears and the staining, in which case a more or less pronounced bluish tint appears. On microscopical examination the red corpuscles are usually terra-cotta colored; but with lamp or gas light they present a grayish appearance, and in the case of older blood they are stained a light green. All nuclei are stained blue, the neutrophilic granules a purplish-red, the eosinophilic granules a bright red, and the basophilic granules of the mast-cells a fine violet. The existence of polychromatophilia on the part of red cells is also well shown, and the basophilic granules of the red cells are colored blue.

I would suggest that those who care to study the problem under consideration begin with a specimen of blood from a well-marked case of pernicious anaemia or from a case of lead poisoning with intestinal symptoms (colic). For the examination a good light (which may be artificial) and an oil-immersion lens are necessary. If granule-cells are fairly numerous a careful scrutiny of the red corpuscles will soon lead to their discovery. Under the conditions mentioned the granules are usually quite large, the size varying between that of a neutrophilic and that of an eosinophilic granule. They are usually round, but some will also be seen which are oval, rod-shaped, or biscuit-shaped, and frequently arranged in pairs, resembling gonococci. At times, and notably with the larger varieties, it appears as though they were lying on the surface of the cells or projecting beyond the outlines proper of the corpuscles. They may be found in all varieties of both nucleated and non-nucleated cells,—viz., in microcytes, macrocytes, poikilocytes, normocytes, and in normoblasts and megaloblasts. They occur in polychromatophilic cells and in cells which present a perfectly normal appearance. They may be found in any portion of the corpuscle; generally they are scattered all over the individual cell, but they are frequently also seen along the periphery, while the central zone may be free from granules or contains but few. At times they are found in cells containing but little haemoglobin, along the extreme periphery, forming as it were an interrupted dotted border. A constant relation between their number and the amount of haemoglobin in the individual cell, however, does not exist. Corpuscles may thus be seen which are manifestly rich in coloring matter, but

in which the cell is literally peppered with granules, while, on the other hand, distinctly anaemic cells may contain but few. Generally speaking, however, there exists a relation between the number of the granules and their size, such that the latter is greater as the number is smaller, and *vice versa*, and, as a rule, coarser granules are found in cells which are paler than normal. But exceptions also occur. However, it is uncommon to find granules in anaemic cells lying in the colorless zone, and in the so-called pessary forms it will be observed that they are almost exclusively found in the narrow rim, which still contains some haemoglobin. (See accompanying plate.)

I have suggested that the beginner in this field should start with a specimen of blood from pernicious anaemia or from a case of lead poisoning with distinct intestinal manifestations, as granule-cells are here most numerous and the granules themselves of larger size. But in such specimens cells will also be met with in which the granules are quite small. After the eye has become accustomed to these finer granules a specimen of blood from a painter with no subjective symptoms of lead poisoning may be studied to advantage. The search for granule-cells may then be quite tedious, but a few will probably always be found, if the individual has recently worked at his trade. In these cases, however, the individual granules will usually be found much smaller, so that a certain amount of experience is necessary to pick out the affected cells without an undue expenditure of time. With practice one is then able to distinguish granule-cells which are in reality visible only "to the experienced eye." Such cells appear as though they had been sprinkled with the very finest microscopical dust. Attention is often directed to them by the suggestion of the very faintest kind of polychromatophilia; but in using this term I do not wish to convey the impression that all polychromatophilic cells are granular. On the contrary, so far as my own investigations go, "granular degeneration" and "polychromatophilic degeneration," such as Ehrlich and Gabritschewski describe, the latter in the circulating blood of man under pathological conditions, are two perfectly distinct conditions, which have nothing whatever in common. Polychromatophilic cells may be granular, but they are by no means always so. The polychromasia to which I have reference is of normal occurrence, to be observed in any specimen of blood. At one time I thought that

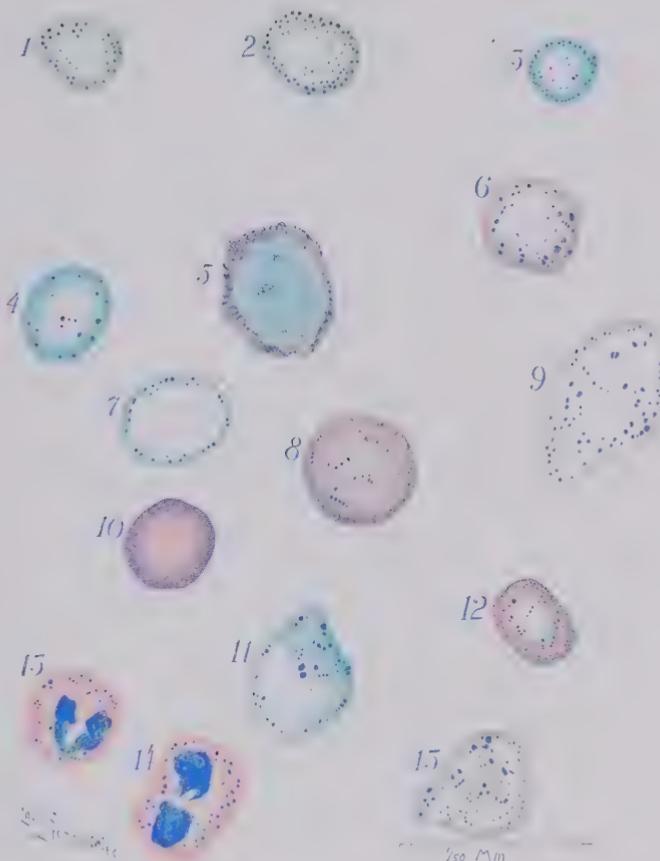


FIG. 1.—Granular degeneration of red corpuscles (eosinate of methylene blue). The plate shows various forms of red cells undergoing granular degeneration : 3, 4, 6, 7, 9, 11, and 15 are at the same time more or less polychromatophilic; 1 and 2 present the greenish tint which is commonly seen when specimens of blood are preserved for some time and are subsequently stained with the eosinate of methylene blue; 13 and 14 are normoblastic red cells with dividing nuclei; in 8, 12, and especially in 10 the extremely fine granules are seen which at first sight suggest a certain type of polychromatophilia; 5, represents a megaloblast in which the protoplasm is undergoing extensive degeneration with marked polychromasia, while the nucleus at the same time presents a granular appearance which may lead to some confusion and has been mistaken for the form of degeneration under consideration. (Zeiss, ocular 4 and  $\frac{1}{2}$  oil immersion  $\times 1300$ .)



this polychromasia was invariably associated with the presence of granules, but I have convinced myself that this is not the case. However, when present they are often seen in such cells.

The person who is familiar only with the large granules which are seen in pernicious anaemia will readily overlook the finer varieties, and for this reason I have made the suggestion to examine the blood of a painter without subjective symptoms, as the latter types are here quite commonly found. To attempt to pronounce upon the absence or presence of granules in various diseases, unless one is perfectly familiar with these exceedingly fine granules, appears to me entirely unwarrantable. Their demonstration demands much more experience than is necessary in the search for malarial organisms, for example.

Besides the eosinate of methylene blue still other stains may be used for the purpose of demonstrating the granules, but I must confess that I have found few methods which are equally satisfactory and none that are more so. Separate staining with eosin and methylene blue (one minute with a one per cent. aqueous solution of eosin and two or three minutes with a one per cent. aqueous solution of methylene blue) gave good results after fixation by heat. Prolonged heating should be avoided; an exposure to a temperature of 135° C. for one or two minutes is quite sufficient.

Hamel suggests the use of Löffler's methylene-blue solution without contrast stain. The specimens are fixed in absolute alcohol (from three to five minutes), washed in water, and immediately covered with the methylene-blue solution. After a few seconds the washed preparations show a light-blue color against a white background. Should they be insufficiently stained the process is continued for some seconds longer; but it is not advisable to leave the specimens in the stain too long from the beginning, as otherwise the red cells are colored a dark blue, which obscures the granules. After washing, the preparations are dried between filter-paper and warmed momentarily over a flame. The blue color thus changes to a light green. On microscopical examination the red cells present a light-green color, while the granules are stained a bluish-black.

For routine work White and Pepper recommend the use of haematoxylin-eosin, or of the carbolate of thionin, after a brief fixation by heat. Their thionin solution is composed of thionin

(French) 0.05 grammie, carbolic acid 1.0, alcohol (ninety-five per cent.) 10.0, and distilled water 90.0. The specimens need only be stained for a few minutes; they are then washed in water, dried, and examined as usual. I have also found that prolonged fixation by heat does not yield as satisfactory results as a brief exposure (two or three minutes at a temperature of about 135°). Fixation with formol I found quite unsatisfactory when the specimens were subsequently stained with carbol-thionin.

Aside from the stain mentioned, White and Pepper obtained positive results with basic fuchsin, anilin green, gentian violet, Bismarck brown, toluidin blue, dahlia, methylene blue, Löftler's methylene blue, and haemalum. With the eosinate the writers apparently made no experiments. Negative results were reached with aqueous solutions of anilin blue, Berlin blue, iodin green, indulin, tropæolin, blue black, "methylene" green, orange G, fuchsin, rosin, Nile blue, benzopurpurin, and Ehrlich's triacid stain. I also can affirm that Ehrlich's stain does not stain the granules in question. By "methylene" green the writers manifestly mean methyl green, and it is interesting that they obtained negative results in view of Litten's claim that he succeeded in coloring the granules with the dye in question. Litten explains the fact that they are not stained with Ehrlich's triacid stain by the assumption that the mixture contains too little of the methyl green. I have stained some of my specimens as he suggests, *i.e.*, by exposing them to a dilute aqueous solution of the dye for about one hour; but in this manner, as also with concentrated solutions, I have obtained only negative results. This is noteworthy, as methyl green is known to be a reliable nuclear dye and as it stains small bits of nuclear substance that have separated within the cell.

Plehn used Ehrlich's haematoxylin-eosin solution after fixing the specimens for at least one hour in absolute alcohol. They are stained for from eight to twelve hours in air-tight watch-crystals. They are then thoroughly washed with water, dried with filter-paper, and examined as usual. The stain is prepared as follows: two grammes of haematoxylin are dissolved in one hundred grammes of alcohol; to this solution are added one hundred grammes of glycerin with an equal amount of water, also ten grammes of glacial acetic acid and an excess of alum. After exposure to the sunlight for from two to three weeks about half a grammie of eosin is added.

The solution is finally placed in a shallow dish for a short while, so as to free it from a portion of the acetic acid, when the stain is ready for use.

*Clinical Results.*—Aside from isolated cases of pernicious anaemia, malaria, and myelogenous and lymphatic leukæmia, my positive results were principally obtained in individuals who were more or less exposed to the action of lead, and my special object in recording the present work is to draw the attention of physicians more generally to the apparently uniform presence of the granule-cells under such conditions. From the fact that my first observations on the occurrence of the granule-cells were principally made in the blood of pernicious anaemia, in which the granules, as already stated, are generally quite large and readily visible in the anaemic cells, I nearly overlooked their presence in the first case of lead poisoning that I had occasion to examine. I must confess that I should have abandoned the search as fruitless and would have reported the case as negative had I not been so deeply impressed with the results of Grawitz and Hamel as to the constancy of the granules under such conditions. In this case for the first time I saw those exceedingly fine granules of which I have spoken, and I am not at all surprised that some observers have failed to find them at times when they also were not as yet familiar with that dust-like appearance which is so frequently seen in the red cells of those exposed to the action of lead, but in whom a specially marked anaemia has not as yet developed.

Through the courtesy of my friend Dr. W. M. Lewis, of Baltimore, I was enabled to study the blood of nineteen individuals who were more or less constantly exposed to the action of the poison. Eight of these were painters, while the others were working in a lead tubing manufacturing company. In addition I obtained the blood of a case of lead poisoning from the service of Dr. H. M. Thomas, of the Johns Hopkins Hospital, in which the granules were likewise found. Of these twenty individuals two presented active symptoms of poisoning,—viz., lead colic in the one case and double wrist-drop in the second. Three had had pain in the stomach some years previous to the examination and three others complained of weak wrists. The remaining cases had at no time presented any definite symptoms of lead poisoning.

Of the men who were employed in the manufacture of lead tubing none had at any time been incapacitated from work as a result of their occupation. Many of them had been in the employ of the company for from twenty to twenty-five years. While all of them were somewhat pale in appearance, examination of the blood did not show a specially marked grade of anaemia in any of them. As I have said, granule-cells were found in all, but were not especially numerous. In White and Pepper's men a much more marked involvement of the cells manifestly existed; it is, however, to be noted that theirs were employés of lead-works proper, while my men had to do almost exclusively with the manufacture of lead tubing. My painters were all out-of-door painters, and had mostly but little to do with white lead at the time of the examination.

Of my two active cases of poisoning one occurred in a painter (lead colic) and the other in a cabinet-maker whose duty had been the joining of seams on the outside of cars by means of white lead (double wrist-drop and lead line). In the first instance the granule-cells were very numerous, several to each field, and most of the granules of the larger variety (the specimens were taken during the attack). In the second case, very curiously, comparatively few cells were found, and in these the granules were quite small. The examination, however, was made at a time when the patient had been under iodides and away from his work for some time.

I also examined the blood of one patient, formerly a painter, who had manifestly passed through an attack of lead encephalopathy six years ago, but who had not worked at his trade for four years. There was still a moderate grade of anaemia, but no granule-cells were found.

For the sake of convenience I have arranged my observations in the lead cases in the accompanying table, in which the results of some differential leucocyte counts are also given, upon which I shall not comment, however, at this place; but I may draw attention to the relatively large number of the mononuclear as compared with the polynuclear cells in a fairly large number of the cases.

As it appeared of interest to ascertain the minimum amount of lead which would bring about the appearance of granule-cells in the blood of healthy individuals, two of the gentlemen working in my laboratory kindly volunteered to act as subjects of experi-

## BASOPHILIC GRANULES IN RED CORPUSCLES.

No.	Exposure to lead.	Subjective or objective symp- toms at time of examination.	Degree of anemia.	Polychroma- tophilia.	Nucle- ated red cells.	Granulo-cells.	Percentage of small mononuclear leu- cocyes.	Percentage of large mononuclears.	Percentage of neutro- philic polynu- clears.	Percentage of eo- sinophiles.	Mast-cells.	Myelocytes.	Remarks.
1	Several years.	Double wrist- drop. Attack of lead colic and lead line on gum.	Normal.	None.	Small number of finely granular variety.	.....	.....	.....	.....	.....	.....	.....	Had been under treat- ment for several weeks.
2	Several years.	Marked.	Moderate.	None.	Very numerous; mostly of large variety.	.....	.....	.....	.....	.....	.....	.....	.....
3	Several years.	Marked.	Normal.	None.	Fairly numerous; fine and moderate size.	.....	.....	.....	.....	.....	.....	.....	Has had several attacks of lead colic; the last a month ago.
4	Several years.	.....	.....	.....	Not numerous; fine va- riety.	.....	.....	.....	.....	.....	.....	.....	.....
5	Several years.	.....	.....	.....	Very few; of fine va- riety.	26.8	18.8	50.6	2.6	0.9	None.	.....	Has occasionally had con- stipation and pain in abdomen and pain in toms.
6	Several years.	Moderate.	Moderate.	None.	Moderate number; of small type.	31.6	17.9	48.3	1.2	0.8	None.	.....	Has never had any symp- toms. Has had lead colic several times.
7	Twenty years.	Moderate.	Normal.	None.	Fairly numerous; of large variety.	19.7	11.8	66.4	1.9	0	None.	.....	.....
8	Eighteen years.	Moderate.	Normal.	None.	Moderate number; all varieties.	.....	.....	.....	.....	.....	.....	.....	.....
9	Twenty years.	Moderate.	Normal.	None.	Very few; of fine va- riety.	17.1	29.3	48.9	2.6	1.9	None.	Two years ago had indica- tions of wrist-drop.	.....
10	Five years.	Moderate.	Normal.	None.	Very few.	21.0	16.5	57.5	4.6	0.4	None.	.....	.....
11	Five years.	Moderate.	Normal.	None.	Fairly numerous; of moderate size.	30.1	20.1	46.6	2.7	0.3	None.	.....	.....
12	One year.	Moderate.	Normal.	None.	Fairly numerous; all sizes.	33.2	7.4	58.7	0.3	0.2	None.	.....	.....
13	Two years.	Moderate.	Normal.	None.	Quite numerous, One in a slide.	14.7	14.4	69.5	1.2	0.2	None.	.....	.....
14	Twenty-five years.	Moderate.	Normal.	None.	Fairly numerous; large size.	24.2	23.1	48.5	3.3	0.7	None.	.....	.....
15	Nine months.	Moderate.	Normal.	None.	Only a few seen.	19.4	13.5	49.3	16.4	1.2	None.	.....	.....
16	Several years.	Moderate.	Normal.	None.	Very few; of finely granular variety.	18.6	17.8	56.1	3.1	1.3	None.	Has had attacks of pain in abdomen; no lead line.	.....
17	Several years.	Moderate.	Normal.	None.	A few of moderate size.	24.0	20.9	51.2	3.1	0.6	None.	.....	.....
18	Five months.	Moderate.	Normal.	None.	Very few; of small va- riety.	15.1	38.0	40.1	2.7	0.9	None.	.....	.....
19	Ten years.	Moderate.	Normal.	None.	Very few; of fine va- riety.	.....	.....	.....	.....	.....	.....	.....	.....
20	Several years.	Not marked.	Normal.	None.	Moderate number; fine variety.	23.5	15.8	53.4	6.6	0.6	None.	Lead burner; has not worked much of late.	.....

ment. To Dr. Heinen I am especially indebted, as in his case he made the exceedingly fatiguing examinations himself. Lead acetate was taken by both gentlemen in pill form, at first in doses of one-half grain three times daily, then in one-grain doses, and finally in two-grain doses three times a day, and in all for from twelve to fourteen days. In both cases the granule-cells appeared after six grains had been taken during a period of seventy-two hours. In one case (Dr. Heinen) about a dozen cells were seen on a slide, while in the other only one could be found after a tedious search. In Dr. Heinen's case they then became more numerous, but remained of the finely and finest granular variety until about thirty grains had been taken, when they became quite numerous and the individual granules nearly as coarse as I have found them in pernicious anaemia. The experiment was then interrupted, as abdominal pain had developed and no stool had occurred for fifty hours, whereas normally two passages were had every day. After this they gradually disappeared, but on the eleventh day following the withdrawal of the lead a few granule-cells could still be found. In Dr. Lewis's case the granules also appeared after six grains had been taken, but, in contradistinction to the first, the cells remained but little numerous. Even after the ingestion of eighteen grains only a few isolated cells could be found after prolonged search. All in all forty-eight grains were taken, and at the end of the experiment they were but little more numerous than during the first days. This marked difference suggests that the degree of resistance which is offered to the action of the lead must vary in different individuals. However, we can scarcely speak of an immunity, as the granule-cells appeared in the second as in the first case and in both after the same dose. It is possible that the difference may be owing to the fact (in part at least) that Dr. Heinen was somewhat anaemic at the beginning of the experiment, whereas Dr. Lewis's haemoglobin was certainly not diminished. In Dr. Heinen's case a nucleated red cell was found on the fifth day after the lead was discontinued.

I have stated before that during the past three years I have paid special attention to the occurrence of the granule-cells in all cases examined and have a long list of negative results to record. It is scarcely necessary, however, to enumerate these in detail,

and it will suffice to say that they comprise a fairly large number of cases of chlorosis, three cases of myelogenous leukaemia, one case of purpura rheumatica, various cases of anaemia accompanying neurasthenic states, certain psychoses, and heart disease; further, cases of typhoid fever, pneumonia, diphtheria, phthisis, post-partum phlebitis, diabetes, syphilis, etc. In the blood of healthy individuals I have never found a single granule-cell, although many were examined. In addition to the lead cases I have met with granule-cells in pernicious anaemia, in myelogenous leukaemia, in lymphatic leukaemia, quite frequently in malaria, in septic conditions, in several cases of carcinomatosis, and in one case of osteosarcoma of the femur, and in one of severe anaemia associated with chronic nephritis.

#### ORIGIN OF THE GRANULES.

As regards the origin of the granules in question various possibilities suggest themselves. On the one hand we may suppose that they are of nuclear origin, while on the other it is conceivable that they are the expression of some change in the haemoglobin or in the discoplasm of the red cells. As a matter of fact, both views are held, and it appears doubtful whether a definite decision can be reached at the present time. The first hypothesis, of course, is based upon the assumption that the enucleation of the red cells takes place through a process of karyorhexis, as held by Kölliker, Neumann, Löwit, Foà, Osler, Mondino and Sala, M. B. Schmidt, Spuler, and more recently by Pappenheim<sup>1</sup> and Masslow.<sup>2</sup> But, notwithstanding the careful and painstaking investigations of these observers, it can scarcely be said that the enucleation of the red cells in the manner indicated is as yet proved. Maximow<sup>3</sup> in his equally extensive investigations was unable to verify the observations of Pappenheim, and as a result of his own work adheres to the hypothesis of Rindfleisch, supported by Bizzozero, Howell, Engel, v. d. Stricht, v. Kostanecki, Säxer, and to some extent also by Ehrlich, according to which the transformation of nucleated

<sup>1</sup> A. Pappenheim, D. Bildung d. rothen Blutscheiben, Diss. Berlin, 1895; Abstammung und Entstehung d. rothen Blutzelle, Virchow's Archiv, vol. cli.

<sup>2</sup> Masslow, Einige Bemerkungen z. Morphologie u. Entwicklung d. Blutelemente, Arch. f. mik. Anat., vol. li.

<sup>3</sup> A. Maximow, Ueber d. Structur u. Entkernung d. rothen Blutkörperchen d. Säugethiere, etc., Archiv. f. Anat., 1899, p. 33.

into non-nucleated red cells occurs through an expulsion of the intact nucleus. But supposing even that the enucleation of the red cells was to take place in the manner indicated, we should certainly expect to find granule red cells especially abundant at those places where the transformation of the nucleated into non-nucleated cells normally occurs and under normal conditions. As a matter of fact, however, all observers who have had occasion to examine the bone-marrow of patients in whom granule-cells were found during life report that, very curiously, corresponding cells were here wanting. Grawitz states that not in a single instance did he find anything that could have been compared to the granule-cells which were seen in the circulating blood. Similar observations are recorded by Litten and Bloch. The only apparent exception is the one case reported by Litten, to which I have already referred. White and Pepper state that they found granule-cells in the bone-marrow of some of their dogs that had been fed with lead, but they add that "in no bone-marrow spread was the number of these granules greater than was found in the peripheral circulation." They very properly suppose that the cells may have been in the *circulation* of the marrow.

Aside from these observations, however, there are still other data which stand opposed to the assumption that the granules in question might be of nuclear origin. It is thus suggestive that they are not stained by methyl green, which is known as a common nuclear dye, and which in Ehrlich's stain also colors the nuclei of both leucocytes and nucleated red cells, while the granules of the red cells, like the basophilic granules of the mast-cells, remain unstained. Litten's statement to the contrary has not been verified either by White and Pepper or by myself. Then again the granules have been found in cells which were undergoing division, and it is of course scarcely conceivable that two processes that are so entirely opposed to each other as cellular regeneration and nuclear destruction could occur in one and the same cell. Bloch noted this appearance in two cases of pernicious anaemia, and, as I have already said, Askanazi pictures the same condition in one of his plates. I have also noted the presence of granules in such a dividing cell (see plate facing page 82). I have further been able to observe, like Grawitz, Bloch, and others, that in pernicious anaemia it is a common experience to find both normoblastic and megalo-

blastic cells literally peppered with granules while the nuclei were perfectly intact and showed no evidence whatever of disintegration. The appearance of a typical normoblast with no evidence of polychromatophilia but studded with granules is indeed a most convincing argument that the granules are not of nuclear origin. Like other observers, I have here also seen particles which were manifestly derived from nuclei, but I must confess that there exists no similarity between the two appearances. On the other hand, it is a common experience to find large numbers of granule-cells in specimens of blood in which not a single nucleated red corpuscle can be demonstrated.

Some observers have pointed out that in the blood of various animals during embryonic life very similar appearances have been noted, and, as their origin under such conditions has also been connected with changes in the nucleus, this fact likewise has been advanced as proof that in adult man the granules must have originated in a similar manner. Engel<sup>1</sup> and Pappenheim found such cells in embryonic mice, and, to judge from the illustration which accompanies Engel's article, it must be confessed that some of the granule-cells at least appear to be identical with those under consideration. Bloch has likewise found such cells in embryonic mice and Schmauch<sup>2</sup> in cats. In embryonic guinea-pigs and rabbits he did not find such cells, but it is interesting to note that he encountered them in one adult guinea-pig, and Ehrlich states that he found them in the adult rabbit. I have myself seen them in the blood of the squirrel. In several human foetuses between the second and ninth month Bloch found no granule-cells either in the blood of the liver or in the spleen or the bone-marrow. In a human foetus of about the sixth month I also found nothing of the kind either in the bone-marrow or the blood of the heart, and I have also obtained negative results in the case of several kinds of fish, in crows, and in sea-gulls.

From the occurrence of such granule-cells in embryonic animals and in some of the lower vertebrates it does not follow, however, that they are of nuclear origin. Whether these are in reality iden-

<sup>1</sup> C. S. Engel, Können Malariaplasmiden mit Kernen kernhaltiger rother Blutkörperchen verwechselt werden, *Zeitsch. f. klin. Med.*, 1899, vol. xxxviii. p. 30.

<sup>2</sup> Schmauch, *Virchow's Archiv*, 1899, vol. clvi. p. 201.

tical with those seen in adult man I am not prepared to decide, but this certainly *appears* to be the case. Like those under consideration, the embryonic granules are not colored by the methyl green of Ehrlich's stain.

Ewing apparently associates the granules with the so-called nucleoids of Maximow<sup>1</sup> and Lavdowsky,<sup>2</sup> but I must confess that I cannot agree with him. Maximow does not picture any appearances which suggest our granular cells. But supposing even the granules to be derived from the nucleoids, would it not be reasonable to suppose that they should be normally present in the blood?

The evidence, on the whole, seems to me overwhelmingly opposed to the assumption that the granules are in any way derived from nuclear substance; and the second hypothesis hence presents itself for consideration, according to which their presence is the expression of some change in the haemoglobin or the discoplasm of the red cells. Grawitz views the phenomenon as a degenerative process affecting the haemoglobin and produced by the action of definite blood-poisons, and Litten, on the whole, seems to incline to the same view. To be sure, the granule-cells are mostly seen in severe forms of anaemia, and are then encountered in all sorts of cells, which are only found under such conditions. But, on the other hand, it must be admitted that they may also be present in the blood at times when no marked diminution in the haemoglobin exists, as in many individuals who are exposed to the action of lead, but who may present no subjective or other objective symptoms of lead poisoning whatever. All observers, moreover, are agreed that the granule-cells in pernicious anaemia commonly persist into convalescence and may be found at a time when there is no decided anaemia remaining. As I have already indicated also, there is no constant relation between the number of the granules and the amount of haemoglobin in the individual cell. Larger granules, it is true, are usually seen in cells which are paler than the rest, and their occurrence in general seems to be confined to those parts of pale cells in which remnants of haemoglobin can still be discerned. But from this it does not necessarily follow that the granules are in any way derived from the haemoglobin. It is thus

<sup>1</sup> Maximow, loc. cit.

<sup>2</sup> Lavdowsky, Blut und Jodsäure u. d. sogenannte Chemotropismus, Zeitsch. f. wissensch. Mikrosk., vol. x. p. 4.

quite conceivable that one and the same factor may lead to the destruction of the haemoglobin, while at the same time it may alter the discoplasm also in such a manner that a deposition of abnormal basophilic material takes place. If one has seen the phenomenon in an advanced case of pernicious anaemia for the first time and has noted the frequency with which polychromatophilic cells are affected, the idea suggests itself at once that possibly the two conditions may be closely related, if indeed they are not identical, the one simply representing an earlier or later phase of the other. Ehrlich himself indeed first thought of such a possibility, and, as I have already stated, regarded both as the expression of a senescence of the stroma and the result of impaired nutrition. More extended observation, however, proves beyond a doubt that polychromatophilia and "granular degeneration" are not interdependent, as it is on the whole much more common to find granules in cells presenting no evidence whatever of polychromatophilia. My personal investigations have led me to the conclusion that the appearance of basophilic granules in red cells, like polychromatophilia, is referable to some change in the discoplasm, and may possibly be the expression of an actual degeneration, meaning thereby a pathological process ending in the death of the cell. In favor of this view is the fact that, as a general rule, the largest granules are found in cells which are especially poor in coloring matter, and in which, as we may assume with Ehrlich, the discoplasm has possibly lost the power of forming haemoglobin. It is further supported by the observation that the formation of the granules in question takes place in the circulation at large and not in the bone-marrow, which would be expected if the granule-cells represented a juvenile form of the normal red corpuscles.

Of the relation which the granule-cells of adult man bear to those occurring in some of the lower animals, and especially to those which are seen during embryonic life, nothing definite can be said, as the observations thus far are still too few to warrant any far-reaching deductions. Of interest, however, is the fact that Grawitz succeeded in bringing about the appearance of granules in the red cells of mice that had been exposed continuously to comparatively high temperatures. In view of the fact that "granular degeneration" is a fairly constant symptom of what we might term *idiopathic tropical anaemia*, these experiments would suggest

that the granule-cells of man and animals may be identical, and, as I have already pointed out, this supposition is also supported by the fact that in both cases the granules in question cannot be stained with Ehrlich's triacid stain.

#### CLINICAL SIGNIFICANCE OF THE GRANULE-CELLS.

Some observers have stated that the occurrence of the granules is neither of diagnostic nor of prognostic significance, but it seems to me without reason. Their presence is, of course, not indicative of the existence of any one disease, but I quite agree with Grawitz when he states that they are found only in conditions in which haemolytic poisons may be supposed to be operative in the body. In the differential diagnosis of pernicious anaemia their presence in considerable numbers is unquestionably of significance, and their number, generally speaking, proportionate to the intensity of the morbid process, which diminishes as improvement occurs and increases again as a relapse takes place. In chlorosis, on the other hand, they are rarely found, and are present indeed only in exceedingly severe cases, and then only in small numbers.

In leukæmia their presence is not constant. In several cases of the myelogenous variety, at least, I have not found them, while they are present in others, but not numerous.

The occurrence of the granules in carcinoma, so far as our present knowledge goes, does not aid in the diagnosis, as they appear only when a cachectic state has developed and other symptoms already exist which establish the diagnosis. In septic conditions, on the other hand, their presence may at times be of aid in the recognition of the character of the morbid process. Ewing states that in the hydramic blood of malarial cachexia they are extremely common, and he adds that in some cases after overstaining with methylene blue nearly every cell shows such bluish points, sometimes connected with fine threads. In the blood of pneumonia, typhoid fever, measles, and diphtheria they are apparently absent, as also in the secondary anaemias associated with hepatic cirrhosis, the various heart lesions, tuberculosis (unless complicated with marked sepsis), neurasthenia, certain psychoses, and usually with nephritis, etc.

Of special importance is the presence of the granule-cells in cases of lead poisoning, and in suspected cases an examination of

the blood should never be omitted. My experience, like that of Grawitz, Bloch, Behrend, White and Pepper, proves beyond a doubt that even a comparatively trifling exposure to the poison in question almost immediately leads to the appearance of the granules in the blood. White and Pepper thus note that twenty-five hours after one of the writers had taken seven and a half grains of acetate of lead granule-cells were found in the blood, and, as I have already shown, they appeared in the case of two of the gentlemen who acted as subjects of experiment in my laboratory after the ingestion of six grains taken in fractional doses during a period of seventy-two hours. On increasing the dose and then continuing on an equal amount the cells may increase in number, and at a time when the first symptoms of intoxication appear—viz., after the ingestion of about thirty grains—they may be quite numerous and the individual granules of considerable size. Coincidentally there need be no other morphological changes in the blood, and in neither of my experimental cases was there any evidence of a pathological polychromatophilia.

Of practical importance is the fact that, while with appropriate treatment the subjective symptoms of lead poisoning disappear, the number of the granule-cells diminishes, until finally they also disappear. As their number, generally speaking, is directly proportioned to the degree of intoxication, and the increase in the granule-cells precedes the occurrence of subjective and the common objective symptoms, I would suggest that in lead-works the blood of the employés be examined at regular intervals, and appropriate treatment be instituted in the individual cases as soon as the number of the cells reaches a dangerous height. In such cases, moreover, the examination of the blood would serve as a direct index of the efficiency of any prophylactic methods that may be employed. The value of the granule-cells from the stand-point of differential diagnosis in cases of coma is now well established.

We may accordingly conclude that the presence or absence of granule-cells in the blood of adult man is a subject which merits attention quite as much as other factors which uniformly receive consideration in the clinical laboratory, while it is freely admitted, however, that they are in no way pathognomonic of any one disease. Their presence or absence is an aid to diagnosis, neither more nor less.

## DILATATION OF THE STOMACH.

CLINICAL LECTURE DELIVERED AT ST. MICHAEL'S HOSPITAL.

BY ALEXANDER MCPHEDRAN, M.D.,

Professor of Medicine, University of Toronto, Canada.

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CASES of dilatation of the stomach are not unfrequently met with, and may be divided into two classes: in the one there is mechanical obstruction at the pylorus, and in the other there is no such obstruction. The following case is a good example of the obstructive class.

Rev. J. C., aged forty-five, has suffered from disturbed digestion for twelve or more years, being worse during the last year or two. Flatulence is the chief symptom, and, when marked, causes epigastric pain. His weight has fallen from one hundred and forty-five to one hundred and eighteen pounds; in the last few years it has not been more than one hundred and twenty-five pounds. He sleeps well; his appetite is good,—in fact, somewhat ravenous at times. The bowels are constipated; but they move daily, the stools being scanty, hard, and lumpy. The urine is not much below the normal in quantity, and is rather high-colored. Thirst is moderate; the skin is somewhat dry, but not harsh. Vomiting has occasionally occurred, caused by the accumulation of material in the stomach. He uses the tube about once a week to give relief and prevent vomiting.

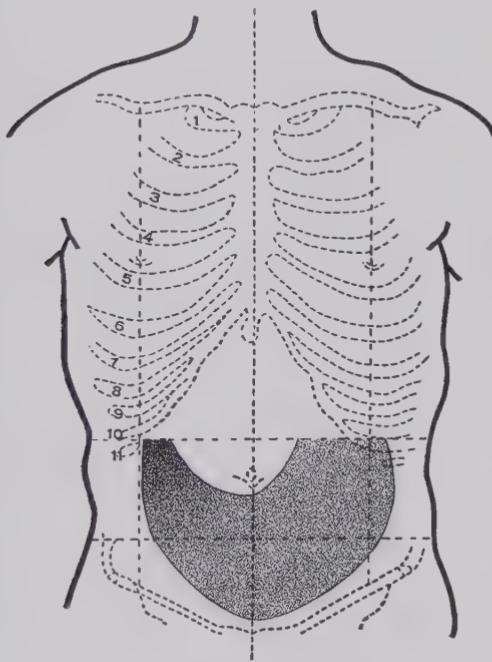
On examination you will observe that he is considerably emaciated; the abdomen is flat, with slight fulness from the umbilicus downward. When there is much food in the stomach, a slight wave is easily perceived, passing from left to right over this fulness; if the abdomen is flicked with a cold wet towel, or even palpated with the cold hand, these waves become large and rounded, three of them being visible at the same time. They are not painful,—in fact, he is scarcely conscious of their occurrence. By palpation a very marked splash is easily produced over the prominent part of the abdomen, even six or eight hours after liquid has been taken.

To the right of and above the umbilicus an oblong mass about

one inch by two inches is easily felt; he discovered this tumor himself last winter. It is slightly tender and freely movable. On deep inspiration the right kidney can be palpated above and to the outer side of the tumor.

A few days ago only toast and water were taken for breakfast; three hours later the stomach-tube was passed and over a pint of fluid evacuated. This liquid contained the toast quite unaltered, and also potato and apple that had been eaten the day before. Much still remained in the stomach and, even after several washings, more

FIG. 1.



Outlined area on the abdomen.

was obtained by elevating the hips while the patient lay on his back. The acidity of the fluid was 80 and the percentage of free hydrochloric acid 38, fully double the normal. There was no lactic acid. The stomach was inflated with air to show its size, position, and relation to the tumor. The abdominal wall was so thin and lax that the information was easily obtained, as is indicated by the outlined area on the abdomen (Fig. 1).

The history and examination of this man show that there is

organic stricture of the pyloric orifice, with moderate dilatation and marked prolapse of the stomach. The gradual formation of the pyloric obstruction has given time for some hypertrophy of the muscular coat of the stomach, as shown by the great peristalsis that is easily excited when the stomach has not been washed out for a day or two. If washed out, however, the peristalsis cannot be evoked even after taking liquid or food; it seems necessary for the food to undergo changes that render it more irritating, before it excites peristalsis.

That the stricture is not very narrow is shown by the fair state of nutrition, by the moderate quantity of stomach contents removed from time to time with the tube, and by the absence of extreme thirst and of great reduction in the quantity of urine. Little water is absorbed by the stomach, so that troublesome thirst and scanty urine are prominent symptoms of pyloric stenosis so marked as to prevent fluid from passing into the intestine.

The next question is as to the nature of the tumor, and on this the prognosis virtually turns. If it be a fibrous structure, the patient's health should be restored when the obstruction is overcome, either by operation on the tumor itself or by gastro-enterostomy. But if the mass be malignant, an operation can give but temporary relief, as by this time neighboring lymphatic structures have been invaded by the disease.

The history and signs present are strongly in favor of the non-malignant nature of this mass. The chronicity of the dyspeptic symptoms, without recent serious aggravation; the long time the tumor has been present, its slow development, and apparent arrest of growth for some months back; the good health and fair nutrition; the excess of free hydrochloric acid in the contents of the stomach and the absence of lactic acid; the freedom from signs of ulceration and of material increase of obstruction during recent months,—all favor the view that the tumor is benign. Pain, more or less distressing, is almost always a symptom in cancer; in this case it has been present only after a large quantity of material has accumulated in the stomach.

It must be borne in mind also that much larger masses than this may result from chronic ulceration of the mucous membrane of the stomach. In a man aged fifty, whom I saw recently, there is a large mass, occupying apparently the whole of the lesser curvature,

that must be non-malignant, as it has existed unchanged since it was discovered, upward of a year ago, and the man's general health has not suffered materially. However, there are no signs of ulceration in the present case beyond those of chronic indigestion; yet ulceration may produce no more definite symptoms. It is not to be overlooked that cases of carcinoma running a very protracted course, even for years, have been reported; it is probable that these were cases of chronic ulceration with great thickening, on which carcinoma developed subsequently. For these reasons I have given this man a favorable prognosis, so far as the nature of the disease is concerned.

Now, how are we to give him relief from his discomfort and improve his strength? In order to maintain a fair state of health it is necessary that a proper quantity of food be digested and that his stomach be quite emptied at least once a day, so as to prevent irritation thereof by decomposition of its contents. With a moderate degree of pyloric constriction this may be fairly attained by giving nutritious food of little bulk in small quantities several times daily, and, if necessary, passing a tube once a day and washing out the stomach. In this way many patients can maintain a good degree of health and vigor. Additional liquid may be supplied to the blood by giving water by the bowel. This man has been carrying out this plan fairly well for some months, but he has now arrived at that stage when it is not sufficiently effective. The pyloric stricture appears to be too narrow to allow the passage of sufficient food, and it has also become too difficult to empty the stomach by the tube. I have, therefore, advised that the strictured pylorus be made freely patent or removed, or that a gastro-enterostomy be done, so as to give free egress for the food from the stomach into the bowel.

By way of contrast I now present to you this gentleman, who has quite as marked prolapse of the stomach and about the same degree of dilatation, but without any obstruction of the pyloric orifice. The position of the stomach, as shown by these lines made after inflation with air through the tube, is quite as low as in the first case. He has been ailing for several years, but is always able to attend to his business as a manufacturer. He has epigastric distress from time to time, frequently with acid eructations, but no pain. His weight when at his best was about one hundred and forty-five pounds; now he weighs only one hundred and twenty pounds, having lost eighteen pounds since last June. He has been having

a good deal of trouble during the last three months, sometimes losing five pounds in as many days. His digestion has been better lately and he gained five pounds in three days. The stomach-tube passed seven hours after a moderate dinner always brings away considerable remnants of the meal. In the morning the stomach is usually empty, but sometimes remains of food taken a day or two before are obtained. Last month he was feeling very poorly and could digest but little food. The stomach was washed out every day and his diet was restricted: one day he had only three raw eggs, some tropon, and a little beef tea, in all only twelve ounces; in the evening the tube was passed and two pints of brownish fluid were siphoned out. The fluid was highly acid, as it always has been on examination. You will see, therefore, that there was a copious secretion into the stomach. The low diet was continued; cerium oxalate was given before food, and, when any discomfort in the stomach was felt after eating, he took calcined magnesia and bismuth salicylate. He also received twice a day a normal saline enema to supplement the scanty supply of liquid that he drank.

In a week he rapidly improved; his appetite returned and he could take a fair quantity of eggs, fish, meat, toast, etc., gaining seven pounds in weight in the last few days. He was despairing of improvement, and I suggested to him the necessity of doing gastroplication or gastro-enterostomy, but he is very much averse to an operation. If we could be certain of a perfectly satisfactory result, I would urge him to submit to it, as there is no doubt that his present improvement is only temporary.

He has been instructed to massage the abdomen thoroughly morning and night after drinking a glass or two of water, and to take for a few minutes general muscular exercises similar to the resistance movements recommended in heart disease. He has also received electrical treatment with an intragastric electrode. Both these measures have been of considerable benefit to him.

His diet has been nutritious, of little bulk, and chiefly nitrogenous, on account of the hyperchlorhydria. Only a small cup of liquid is taken with each meal, so as to prevent distention of the stomach. Rest in the recumbent position for an hour or so after meals might aid him, as it would give an opportunity for the stomach to empty its liquid contents into the intestine more easily; but he is too busy to carry out such a plan. As is usual with such cases, he is always much benefited by the rest and relaxation of a holiday.

In both these cases the cause of ill-health is the same,—viz., hyperacidity with imperfect digestion and stagnation of food in the stomach. The gastrophtosis is due to debility and loss of tone in the supporting gastric structures. The dilatation in the second case is caused by atony of the wall of the stomach; in the first case it is due chiefly to the pyloric obstruction, but partly also to atony, as it is in most cases of pyloric obstruction.

[NOTE.—Shortly after you last saw Rev. Mr. C., now four months ago, my late lamented colleague, Professor L. M. Sweatman, performed gastro-enterostomy on him. He recovered without any untoward symptoms, and has since been very well, having gained over twenty pounds in weight; he has been doing ministerial duty as usual. This is the first opportunity I have had of examining him since then. The pyloric tumor that was easily located before the operation cannot now be felt. There seems to be some thickening in the situation yet. On inflation, the stomach is found to be in the same situation as before the operation, and is quite as large. A full breakfast was eaten at eight o'clock, toast and water were taken at noon, and the stomach-tube passed an hour later. Ten ounces of creamy, gruel-like fluid were siphoned from the stomach, and even more was washed out afterwards. The fluid siphoned from the stomach separated into the three layers characteristic of dilatation of the stomach,—a frothy upper layer, a fairly clear middle layer, and a bottom one of pultaceous gray material. Small bubbles of gas can be seen constantly forming in the bottom layer and ascending to the surface, showing active fermentation. The fluid is highly acid, showing a total acidity of 95 and free HCl 53. There is no lactic acid reaction.

These results are disappointing, indicating as they do substantial dilatation of the stomach and an impediment to the escape of the contents by obstruction of the artificial opening, by contraction, or by kinking of the intestine, and the projection of its wall into the opening. The disappearance of the pyloric tumor renders it probable that that orifice is again patent; even if it is so, the passage of contents will be obstructed if the kinking exists. The good general condition indicates that the obstruction, if it exists, is recent. He has been advised to use the stomach-tube once or twice a week to prevent stagnation of food; to take food of small bulk, chiefly nitrogenous; and to massage the abdomen morning and evening.]

## CASES OF PLEURISY WITH MORE OR LESS PERMANENT PNEUMONIC INDURATION—ARE THEY TUBERCULOUS?<sup>1</sup>

BY ROBERT H. BABCOCK, M.D.,

Professor of Clinical Medicine and Diseases of the Chest, College of Physicians and Surgeons, Chicago; Attending Physician to the Cook County Hospital, etc.

WITHIN the last three years I have observed four cases of pulmonary disease which were to me unusual and whose pathology it was difficult for me to explain on any other hypothesis than that they were tuberculous. For this reason I have thought their narration might prove of interest and arouse a profitable discussion. As too much detail is wearisome, I will narrate them concisely.

CASE I.—In April, 1898, a young man about twenty years of age was brought to my office by his attending physician because of pleuritis. Three weeks before he had complained of pain in the right side, chilliness, cough, and malaise. He was found to have a temperature of 101° F. and to present signs of right-sided pleurisy. My examination showed slight increase in the diameter of the right thorax, the apex-beat displaced to the left nipple, and the liver palpable. Pectoral fremitus was increased over the right upper lobe, but diminished below and practically absent at the posterior base. Over the right apex there were marked dulness and bronchial breathing, but no râles as far as the third rib in front and behind to just below the ridge of the scapula. Below this level the percussion note was flat, bronchial respiration was feeble but not absent, and there were no râles. The case was pronounced one of pleurisy with effusion and probably tuberculous, with pneumonia of the upper lobe. As three weeks had elapsed without absorption and his temperature was still elevated (about 101° F.), I advised rest in bed and aspiration. This was done a few days later and twenty ounces of clear straw-colored serum were obtained. Meanwhile his scanty mucous sputum had been examined for tubercle bacilli, but

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<sup>1</sup> Read before the Chicago Society of Internal Medicine, November 27, 1901.

none discovered. After the tapping, physical signs did not change in the least, dulness and bronchial breathing remaining just as pronounced as before. Even the position of the apex-beat did not alter appreciably. In short, the patient's pulmonary and general condition persisted *in statu quo*. He was kept in bed, in spite of his declarations that he felt so well he wanted to get up and did not see why he was confined to his bed. At the end of another week or ten days his attending physician, not satisfied with our aspiration, called in a surgeon to make another, which he did with the result of withdrawing only about six ounces of serum. The lung findings remained as before and the constitutional symptoms persisted. I did not see him again that year, but learned that he gradually improved, and after some weeks was able—or, rather, was permitted—to resume his former active habits, although his lung did not clear up.

The following summer, more than a year subsequent to my first examination, he saw me again, at my request. I found the right half of the thorax in nearly or quite the condition of a year earlier. There were marked dulness and bronchial breathing over the upper lobe, while below the third rib the note was nearly flat, resistance was extreme, pectoral fremitus was diminished, and breath-sounds were feebly bronchial. That side was manifestly smaller than the other. In addition to these findings, however, there were impaired resonance at the left apex, with bronchovesicular respiration and fine moist râles,—in short, the signs which are universally thought to indicate an early stage of pulmonary tuberculosis. My request to send me sputum for examination was ignored, but I have recently learned that he subsequently went to Asheville, North Carolina, and there died of consumption last spring. This termination of the case seems to bear out my original diagnosis of its tuberculous nature.

That at the time of my first examination the lung was in a state of pneumonic consolidation, and not collapse, seemed to me certain from the physical findings. There was pleuritic exudate, to be sure, but the insignificant degree of pressure, as shown by physical signs, and the results of two aspirations, with persistence of the physical signs afterwards, and the evident cirrhosis of the lung a year later,—all indicated, I believe, that the pleuritis had been followed by pneumonia of the interstitial type, or if of a bronchopneumonic

form, then, at all events, with subsequent fibrosis, and not softening, as is usual in tuberculous pneumonias.

CASE II.—This patient was a lad, twelve years of age, whom I saw repeatedly with Dr. E. H. Webster, of Evanston. The family history was bad, one maternal uncle having died of pulmonary tuberculosis and another being then ill of the same disease in the boy's home. While apparently in usual health, the lad developed what appeared to be a cold, but a day or two thereafter Dr. Webster discovered pleurisy of the right side. When I saw him, the signs were those of solidification of the apex, with a small amount of effusion, as shown by the slight pressure on adjacent organs. The daily fever was not high, rarely going above 102° F.; constitutional disturbance was not marked; cough was rather troublesome, but expectoration was wanting, or at most very scanty. No improvement resulting from appropriate treatment after several weeks, the doctor aspirated, but obtained only a few ounces of serum. The case dragged along many weeks without change in the condition of the lung, and at length the boy was sent on to a ranch in Kansas. The last report was that he had regained health, but that his side was still dull.

CASE III.—This patient, the wife of a physician, was seen in August, 1899. She was attacked by pain in the left side in July, but had not been obliged to take to her bed. It was not until after a week or more that her breathing became so dyspneic as to attract her attention and a pleuritic effusion was discovered. Dr. Van Hook then withdrew five pints of serum. When I saw her, two weeks or so afterwards, the entire left side was intensely dull, with bronchial breath-sounds, but no râles. Displacement of the heart was very slight, but, from the obliteration of Traube's crescent-shaped area, I concluded that there might still be more fluid present than was supposed, and advised a repetition of the tapping. This was again done by Dr. Van Hook, who, however, obtained only five ounces of clear serum. The physical signs subsequently remained unaltered, and seemed to me to indicate consolidation of the apex as well as pleuritic thickening below. Two weeks ago I examined this patient again, and found slight retraction of the left side, pronounced dulness below the level of the second interspace, feeble bronchial breathing, and posteriorly an ill-defined rubbing sound. The upper lobe above was also dull, but not so markedly, and the

breath-sounds had a bronchovesicular quality. The patient felt perfectly well and had gained in weight.

Of the nature of this case I am not so sure, and yet I am inclined to regard it also as tuberculous. I feel certain, however, that at the time of her illness there was an inflammatory induration and not merely collapse of the left lung, for when I saw her the dulness and bronchial breathing over the apex were out of proportion to the evidence of pressure and the results of aspiration. If in this case the lung was also involved, it has somewhat cleared up, to judge from the finding at the present time. What changes are now present may be those merely of considerable pleural thickening and consequent inability of the lung to re-expand.

CASE IV.—Last January Dr. Byford referred to me a young married woman on whom he had operated in November, 1900, for ascites, secondary, it was stated, to tuberculous ovaries. The patient was thin and anaemic, and at the left apex the physical signs were suspicious of a small tuberculous deposit. Nevertheless, on milk, raw eggs, etc., and plenty of fresh air, she gained nine pounds in weight and the left apex seemed to clear up. By February she felt so well that she did not report until March. She then returned, saying that on the Tuesday previous she had suddenly felt chilly and indisposed, with a dull aching pain in her right side, and noticed a frequent dry cough. My investigation showed a temperature of  $100.4^{\circ}$  F., pulse 115, respirations 20, and, below the second rib in front, pronounced dulness, with diminished but not absent fremitus and faint bronchial breathing, no râles. The apex-beat was just outside the left nipple and the liver was palpable. Here was a pleuritis with small effusion that had developed in the midst of apparently good health, but in a tuberculous patient. At first I detected only a pleuritic effusion, which reached high, yet did not exert much pressure. One week later, without any more evidence of pressure, the apex of the right lung had become intensely dull and resisting, with bronchial respiratory sounds, but no râles. Her dyspnoea had increased so that she could not sleep with comfort. It was decided to aspirate, although I did not expect to get much fluid. Accordingly, only eleven ounces of clear serum were secured, and, as in the other cases, the tapping was followed by no appreciable alteration or improvement of the physical signs. Moderate fever and dry cough persisted. After more than a month had elapsed and she

had begun to think herself pretty well, she suddenly developed another pleurisy, with effusion on the left side. This time sixteen ounces were obtained by aspiration, as I have since been informed.

I examined this patient again ten days ago. She reported herself as very well and in extra good weight, but the right side was appreciably retracted, and dulness existed from apex to base, being, as always before, specially marked below the level of the second rib. Bronchial breath-sounds were also present in the upper lobe, so that I feel sure the apex is cirrhotic and not merely collapsed. There was also evidence of the left-sided pleurisy, which, to judge from the physical signs, had not reached above the fifth rib anteriorly, although more fluid had been obtained by aspiration than from the right side.

In these cases I was impressed by several quite peculiar circumstances. (1) The patients did not seem very ill, and, judged by the mildness of the pyrexia and other symptoms, their illness seemed to be of a low grade of activity. All but one appear to have recovered and now to be in good health. (2) Judging from the extent and degree of dulness, considerable effusion would have been suspected. Yet the insignificant degree of pressure effects and the result of tapping demonstrated that the exudate was poor in serum and rich in fibrin, and that the degree of dulness and the quality of the respiratory sounds at the apex could not be due to pressure of fluid on the lung, since the amount of fluid was in reality small. (3) One has since died of pulmonary tuberculosis and in two of the others the personal and family history was that of tuberculosis. (4) Examination of the sputum, when any could be obtained, which was not always the case, failed to reveal tubercle bacilli.

It is to be regretted that the serum was not obtained in such a manner that it might have been injected into animals and subjected to a culture test. I can only conjecture, therefore, concerning the pathology of these cases, but the only conclusion that seems to me to explain them is that they were tuberculous. I believe that in three instances at least there had existed a small tuberculous focus at the apex, and that from this focus bacilli were carried by the lymph stream in a reverse direction to the pleural cavity, where they set up a pleuritis which was chiefly fibrinous. Of course, this theory lacks the verification of post-mortem examination, but the well-known action of tuberculosis makes such an explanation reasonable.

# GASTRO-INTESTINAL AUTOINTOXICATION.

BY JOHN C. HEMMETER, M.D., Ph.D., etc.,

Professor in the Medical Department, University of Maryland; Director of  
the Clinical Laboratory, etc.

Baltimore, Md.

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## PART I.

### NATURE AND CONCEPT.

THE history of medicine is largely a history of studies and inquiries into the origin of disease. The processes which have been recognized as inducing disease have been relegated to four types, which, named in the order of their importance, may be grouped as follows: (1) infections, (2) disturbances in nerve reaction, (3) disturbances in nutrition, and (4) primary elementary cell dystrophies. More and more the agency of infection has been found to encroach upon the domain of the other three pathogenic factors; yet the truths that are at present known, or believed to be known, concerning infection do not suffice to explain the origin of disease in general, nor even of such maladies as we have many good reasons to believe are infectious.

### TERMINOLOGY.

Von Jaksch<sup>1</sup> distinguishes between exogenous intoxications, caused by poisons entering the system from without, and endogenous, due to poisons developed within the system. There is danger of confusion in these terms, for, whilst a poison introduced from without generally produces an exogenous intoxication, it may also at the same time set up one that is endogenous; and, conversely, an endogenous or intrinsic poison may provoke either an endogenous or an exogenous intoxication. We must bear in mind that a poison which is within the gastro-intestinal canal—the stomach and intestines—is still outside of the body and must be regarded as exogenous. An extrinsic poison may act in two ways; first, it may be absorbed into the system and act directly upon the cells of

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<sup>1</sup> Nothnagel's spec. Path. u. Ther., vol. i.

the tissues, thereby causing an immediate exogenous intoxication; secondly, in its action upon the cells of certain internal organs this poison may cause a pathologic activity of those cells, leading to an abnormal internal secretion, and it may be the products of this pathologic cell activity which set up the intoxication, and not the introduced poison. Here an exogenous poison has set up an endogenous intoxication.

Whilst abnormal products of cell activity, constituting an endogenous poison, are naturally most liable to set up an endogenous intoxication by causing a direct detriment to the cells of the tissues, it is also well known that these intrinsically generated poisons at times act only after they have been discharged into the ducts of the body, or even into the gastro-intestinal canal, where accumulating they may be reabsorbed. Such collection and reabsorption really constitute an exogenous intoxication.

It is essential to keep in mind the distinction between the poison and the intoxication. All intoxications resulting from poisons absorbed from the outside (including the gastro-intestinal canal) are to be regarded as exogenous, whether the poison was produced within the system or not. The term endogenous intoxication is applicable only to those poisons which are generated within and act within the system. Endogenous intoxications may be of two varieties: either (1) the poisons are generated by the cells of the body (these are the genuine and typical autointoxications) or (2) the poisons are products of bacteria or the discharges of parasites produced within the system.

#### CLASSIFICATION.

A satisfactory classification of the various forms of autointoxication is not practicable in the present state of our knowledge. Von Jaksch classifies them into: (1) Retention intoxications, caused by the accumulation of physiological products of metabolism in consequence of closure or insufficiency of any one path of excretion. (2) Noso-intoxications, due to pathological processes which alter the normal course of metabolism in such a way as to produce harmful, in place of harmless, products. Under this group he<sup>1</sup> distinguishes (a) diseases produced by disturbances of metabolism occurring spontaneously in the organism, and (b) diseases caused by metabolic

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<sup>1</sup> Wiener klinische Wochenschrift, 1890, No. 52.

products of bacteria. (3) Autointoxications resulting from the effects of normal substances in large quantities, which, however, are poisonous, or of poisonous substances which have originated from normal products. It is evident in this scheme that the autointoxications for which von Jaksch establishes a separate class are logically comprised in his second class, called noso-intoxications.

For didactic reasons, Albu<sup>1</sup> classifies these conditions into four groups: (1) Autointoxications caused by loss of function of an organ; these are generally glandular diseases, with or without anatomical changes. This group comprises myxœdema, the strumous cachexia, pancreatic diabetes, acute yellow atrophy of the liver, and Addison's disease, which is supposed to originate in some form of atrophy of the adrenal bodies. They are diseases, then, caused by exclusion or loss of function of those organs to which the newer physiology attributes a destructive power of toxic metabolic products originating in the organism. (2) Autointoxication by general abnormalities of metabolism, without any evident localization. To this class belong the diseases in which the intermediate products of metabolism and the products of regressive metamorphosis reach the circulation; for instance, diabetes, gout, and oxaluria. (3) Autointoxication by retention of physiological products of metabolism in the various organs; for instance, toxic phenomena after extensive skin burns, carbon dioxide poisoning, when normal respiration is interfered with, and uræmia. (4) Autointoxications caused by overproduction of physiological and pathological products of the organism,—acetonuria, diaceturia, hydrothionæmia, ammoniæmia, cystinuria, and diabetic and carcinomatous coma. The intoxications originating in the intestinal tract belong to both groups (3) and (4). They are observed in various stages of acute and chronic digestive disorders; in ileus, incarcerations, and strangulations,—in fact, all the obstructions; in the forms of intestinal dyspepsia or indigestion, etc.

ENDOGENOUS INTOXICATIONS, therefore, may be classed as follows:

(1) *Direct Autointoxication.*—(a) Intrinsic, metabolic, or secretory, due to excessive or pathological discharges from the cells of one tissue acting immediately upon the cells of other

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<sup>1</sup> *Autointoxicationen des intestinal Tractus*, Berlin, 1895, p. 7.

tissues of the body. (*b*) Necrobiotic, due to the action of the products of abnormal metabolism, decomposition, and necrosis of the cells of one tissue acting directly upon the cells of other tissues.

(2) *Infectious or Parasitic Auto-intoxication*.—(*a*) Due to bacteria and other unicellular parasites (amœbæ, rhizopoda, etc.). (*b*) Due to the larger parasites.

Of EXOGENOUS INTOXICATIONS, due to toxines entering the system from without, we must distinguish two varieties,—(1) extraneous, (2) indigenous.

(1) *Extraneous*.—Due to toxines extraneous to the organism, and introduced through the skin, the gastro-intestinal, the respiratory, or the genito-urinary tract.

(2) *Indigenous*.—These are due to the reabsorption of products of the tissues which have already been excreted, and here again we recognize two subvarieties: the retained excretion may either be reabsorbed unaltered or after it has undergone decomposition. We may thus have under the indigenous exogenous intoxications (*a*) indirect exogenous auto-intoxications, due to the absorption of retained excretions as such, and (*b*) those resulting from the absorption of decomposition products developed in external excretion.

It is regrettable that prominent French, German, and English writers have expressed themselves in terms suggesting that the contents of the gastro-intestinal tract are within the body. Thus, Bouchard, Albu, and many of the other authors cited below have classed the systemic poisons due to the absorption of products of gastro-intestinal fermentation and putrefaction under the heading of auto-intoxications, together with the toxic results of pathological cellular activity. Evidently these are two widely different processes. It is all-important that a sharp distinction between the bacterial and cellular poisons should be drawn, and that the term *auto-intoxication* should be defined as an intoxication due to the action of substances *formed from or by the cells within the body*. The secretion of the cells may be their normal product, but act pathologically upon other cells; or the product of the cells may be abnormal and due to their disintegration.

In an interesting article on the classification of the intoxications, J. George Adami advocates this definition of the subject,<sup>1</sup>

<sup>1</sup> Amer. Med., July 27, 1901, p. 132.

and correctly states that if the term gastro-intestinal autointoxication, as is generally used, refers to the effects of bacterial action upon the food, the condition is as much an exogenous intoxication as that caused by the drinking of carbolic acid.

*History of the Evolution of the Doctrine of Autointoxication.*—At the beginning of the nineteenth century the ancient views of humoral pathology and the doctrines of dyscrasias still occupied the medical mind. The endogenous causes of disease were thought to be abnormal compositions of the blood, secretions, and tissue-juices. As this view was gradually replaced by investigations based upon the natural sciences, pathology acquired a more exact and precise foundation. The evolution of cellular pathology brought with it the development of the chemistry of the cell,—that is, of the chemical physiology and pathology. Even later, when bacteriology, the most recent daughter of cellular pathology, arose and seemed to absorb the doctrines of its mother science, cellular chemistry asserted its rights. In the search for the origin of disease by the aid of modern cellular pathology and bacteriology, the chemical nature of the “materies morbi” could not be pushed to the background.

It required several decades before the technique and rough foundations of bacteriology were happily surmounted. But even during this time Pasteur repeatedly insisted that the material which is essential to the existence even of an infectious disease is of a chemical nature.

Organic cell life is comparable to a chemical factory. From introduced raw materials it manufactures those substances which are required for the maintenance of the organism. These are incorporated in the tissue-juices and protoplasm. During the process of cell life and the performance of cell functions, waste products are formed, which are excreted and removed from the cell body and eventually from the organism. Intake and output, assimilation and growth, destruction and breakdown of protoplasm by function,—anabolism and catabolism,—these terms comprise the life history of the cell. But all these processes, although inseparably connected with the morphological elements of the cell, are in their innermost nature, nevertheless, chemical; even the life and activity of the bacteria must be considered in the light of chemical processes. The bacteria, *per se*, may cause an infection; they may produce primary

or metastatic foci of disease, but these disease foci are, as a rule, local, for the general disseminated phenomena of these diseases are always caused by toxic metabolic products of the bacteria. These may originate within the body of the bacteria themselves (proteine) or they may be produced from the constituents of the animal cells in and upon which the bacteria are parasitic.

In modern medical literature we find a superabundance of publications directed towards the recognition of external causes of disease. Careful examination of the results gained thereby shows that they by no means suffice to explain the origin of many diseases. After all the facts of etiology derived from a study of infection, of disturbances in nerve reaction, of disturbances in nutrition, and of primary elementary dystrophies have been brought together, a large number of diseases remain for which no satisfactory explanation as to their origin has been offered. The so-called external causes of disease are particularly insufficient to explain those pathogenic disturbances which arise from some internal detriment or abnormal change. At this point we begin to seek the cause of the disease within the cell itself.

#### DEFINITION OF AUTOINTOXICATION.

Autointoxications in the strict sense are morbid conditions which originate by the agency of toxic products of metabolism in the organism itself, and in the etiology of which the direct activity of micro-organisms can be excluded. Among the safe examples of such autointoxication we can classify only those endogenous diseases of which the etiological poison or toxine is known. A knowledge of these toxines is the *sine qua non* for the recognition of an autointoxication. Strictly speaking, therefore, there are only three conditions which can logically be considered autointoxications. These are (1) *ammoniæmia*, the supersaturation of the blood with ammonium carbonate, which, according to Treitz, is formed from urea within the intestinal canal and absorbed into the circulation; (2) *hydrothionæmia*, the absorption of sulphuretted hydrogen ( $H_2S$ ) from the intestine; and (3) *diabetic coma*, which is most probably produced by the formation of beta-oxy-butyric acid in the course of diabetes mellitus. The first and second are exogenous, and the third probably endogenous intoxication, though this is not yet certain. With a little stretch of the imagination, three

abnormalities of metabolism may be included which do not run their course with intoxication symptoms of the general organism. These are cystinuria, aleaptonuria, and oxaluria. In my opinion, these conditions cannot be regarded as independent diseases peculiar to themselves. Not one of them can, in the present light of our knowledge, be considered a disease *sui generis*. Von Jaksch<sup>1</sup> would include under the autointoxications also acetonæmia and uricacidæmia. Under the heading of uricacidæmia he says that there are diseases in which the most prominent phenomenon is the occurrence of increased quantities of uric acid in the blood as well as in the urine. This statement that uric acid occurs in the blood, is no doubt a *lapsus calami*, for in none of the literature quoted by him nor in any other literature known to me is satisfactory evidence given that uric acid, as such, occurs in the blood. This lack of preciseness of von Jaksch is doubtless one of the causes of the wide prevalence of the error that uric acid occurs in the blood as such. What this celebrated clinical chemist evidently intended to say was that in certain diseases uric acid occurs in the blood in the form of sodium bi-urate or quadri-urate.

#### SIGNIFICANCE OF THE DOCTRINES OF GASTRO-INTESTINAL AUTOINTOXICATION.

In order to establish the existence of an intestinal autointoxication we have a right to demand two clinical proofs: (1) The demonstration of the poison or toxine itself, (2) the demonstration that the locality of its formation is in the gastro-intestinal tract. Unfortunately, these two requisites have not been supplied in a great many of the diseases which Bouchard, the originator of the doctrine of autointoxication, classes among these abnormalities. The evidences furnished by Bouchard and others in support of their doctrine may be separated into experimental and clinical evidences.

#### CRITICISM OF THE EXPERIMENTAL EVIDENCES.

I have already stated that the doctrine of autointoxication, in order to acquire a safe foundation entitling it to the claim of being an intrinsic part of didactic medicine, requires the demonstration (1) of the poison and (2) of its source. Not until these two requisites are fulfilled can the claim of the theories of autointoxication

<sup>1</sup> Die Vergiftungen, in Nothnagel's spec. Path. u. Ther., Bd. 1, p. 624.  
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to clinical citizenship, as it were, be conceded. Hitherto the advocates of this hypothesis have thought that the evidence was sufficient if they found a poison in the urine. Ofttimes they did not isolate the poison, but contented themselves with efforts to prove that the urine was toxic for certain lower animals. What is necessary, however, to make the theory acceptable to conservative clinicians is not the demonstration of a toxic property of the urine, but isolation of a toxine from the urine and the demonstration of the same toxine at the place of origin of the disease. Frequently the toxine is not at all demonstrable at the original location of the disease. For instance, if it has developed in the stomach or intestine, it may have been expelled by vomiting or purging. Recently, however, W. B. Haliburton and John F. McKendrick<sup>1</sup> have isolated, from the gastric contents of a patient suffering from benign pyloric obstruction and tetany, a toxic substance that when injected into an animal produced a marked fall of blood-pressure and slowing of the heart-beat. This substance was not present in the normal gastric contents during health, and after neutralization of a solution of this toxine no fall of blood-pressure was obtained on animals. The attacks of tetany in this patient ceased after an operation on the stomach restored the downward progress of the ingesta. The pyloric obstruction had developed as the result of a cicatrix of an old gastric ulcer. Dr. W. D. Haliburton, whom I had the pleasure of meeting in London in 1900, is a physiological chemist whose work has been characterized by admirable precision and conservatism. I am disposed to attribute much importance to his results, furnishing one of the first reliable evidences that gastric tetany is really caused by autointoxication. This case is an instance of the discovery of the poison at the source of origin of the disease, and not in the urine. Albert Albu makes the statement that the positive finding of toxicity of the urine includes a local origin (meaning, as a rule, the gastro-intestinal tract) of the poison and its resorption.<sup>2</sup> In opposition to this statement, I must insist that the presence of a toxine in the urine does not necessarily include a local origin of the poison and its resorption; for there are undoubtedly toxines which arise in the circulating blood itself, or in such a disseminated

<sup>1</sup> British Medical Journal, June 29, 1901.

<sup>2</sup> Ueber die Autointoxicationen des intestinal Tractus, p. 197.

manner throughout the body that they are borne, as it were, directly into the circulation and do not require absorption; we can only speak of absorption where a substance is drawn into the blood or lymph circulation either from the gastro-intestinal tract, from one of the hollow organs of the body, or from cavities that have been formed under pathological conditions. We certainly are not justified in speaking of a local origin of the poison in uric-acid poisoning, chlorosis, cystinuria, etc., conditions which Albu classes among the autointoxications, and the origin of the toxines of which is not even known. For although Brieger and Stadthagen declare cystinuria to be an intestinal mycosis, they furnish no satisfactory evidence. It is unsafe to speak of local absorption of a toxine in any disease the direct cause of which is unknown.

Another weak point in the autointoxication theory is that only in the three conditions mentioned—viz., ammoniæmia, hydrothio-næmia, and diabetic coma—have the symptoms been traced to anything like a specific poison. The advocates of the theory explain this by the well-known fact that a toxic substance, after having been absorbed from its original source, may undergo manifold transformations before it is excreted by the kidneys, so that substances appear in the urine widely different from those which were originally formed in the body. For instance, in acute yellow atrophy of the liver leucin and tyrosin appear in the urine. These are products of albumin breakdown; but it is certain that they do not cause the disease symptoms, for when leucin and tyrosin are injected into the blood-vessels of animals no detrimental effects on the nervous system have been noticed (Frerichs, Panum, Billroth). These substances are simply the expression of an extensively altered metabolism. In fact, in acute liver atrophy the experiment of functional exclusion of the liver has been carried out by the disease in the human being. The substances that are brought to the liver from the digestive canal are no longer transformed by this organ. They are permitted to reach the blood-current in the unassimilated form of the intermediate substances of metabolism. These intermediate substances appear in the urine in place of the end product of the oxidation of the albuminous bodies. During acute yellow atrophy the urea in the urine becomes less and less, and occasionally disappears entirely, and these intermediate substances take the place of urea. I mention all this to show that what

is found in the urine cannot always be attributed to the original source of the disease. As further examples of the transformation which absorbed substances undergo during their passage through the circulation to the urine, the following may be cited: beta-oxybutyric acid may be excreted as diacetic acid and acetone, salol as salicylic acid and phenol, benzoic acid as hippuric acid, etc.

The toxic products of the decomposition of carbohydrates in the stomach and intestines are so small in quantity and so largely diluted in the blood that it requires a considerable effort of the imagination to conceive of a detrimental effect of these products upon the general organism. One of the most frequent products of carbohydrate fermentation, lactic acid, is never found in the urine, not even in cases of gastric carcinoma, in which it may be formed in considerable quantities in the stomach. It can accordingly not be assumed that it is absorbed in considerable quantities, or, if it is, we must suppose that it undergoes some transformation. At least I have never found lactic acid in the urine when this acid was present in the stomach contents by the Uffelmann test. No convincing proof is furnished for the theory of intestinal autointoxication by attempts to demonstrate the toxicity of the urine and faeces or to show the effect of alcoholic extract or urine and faeces upon animals. In many of the experiments recorded it is evident that these extracts were made poisonous by the materials employed in their preparation. Normal urine and normal faeces, when injected in sufficient quantities, are of necessity poisonous to small animals; conservative men will fail to see in such experiments any proof that the individual from whom these excretions were taken suffered from autointoxication. The experiments which tend to show that indol (indican) and skatol are poisonous for the organism are totally fallacious, for it takes one gramme of these substances per kilo weight of rabbit to produce intoxication symptoms. In a human being of medium weight, sixty grammes of indol would be necessary to produce toxic phenomena. As a matter of fact, the total quantity produced in the intestine amounts only to a fraction of one gramme.

A curious deficiency is observable in all the reported cases of hydrothionæmia, which is put down by Albu<sup>1</sup> as an intestinal auto-

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<sup>1</sup> Ueber die Autointoxicationen des intestinal Tractus, p. 125.

intoxication of which the exact proof has been furnished by Friedrich Betz.<sup>1</sup> This is the condition upon which Senator founded his conceptions of self-poisoning of the organism.<sup>2</sup> In all the cases of hydrothionæmia that I could find recorded in literature the hydrogen sulphide ( $H_2S$ ) was discovered in the urine and noticeable by the odor of the eructations and in the expired air. Right here attention may be called to the fact that if a patient eructates sulphuretted hydrogen his breath will very frequently contain this gas, but this cannot, in my opinion, be considered an evidence that the gas has been absorbed into his circulation and is expired from his lungs. Most writers on hydrothionæmia gravely mention that the  $H_2S$  is also contained in the faeces (!), but not one test of the blood for  $H_2S$  is on record. With proper chemical methods very little  $H_2S$  could be detected if it were contained in the blood. The assumption that the hydrogen sulphide is contained in the blood is based upon the demonstration of this substance in the urine. It is argued that it could not appear in the urine unless it had reached the kidney by way of the circulation. A personal study of the intestinal gases has convinced me that even in pathological conditions  $H_2S$  is not produced in large quantities in the intestines.<sup>3</sup> Some years ago Bergeon conceived the idea that pulmonary tuberculosis could be healed by injecting large quantities of sulphuretted hydrogen into the intestines. This method was tried on fifteen tuberculous patients at Bay View Hospital, Baltimore, while I was physician in charge of that institution (1886-1888). The  $H_2S$  did not heal the pulmonary phthisis, nor did it exert any toxic effect upon the individuals into whom it was injected; but its effect on the attending physician and nurses was disastrous, so much so that this disagreeable feature, more than anything else, soon caused the cessation of the experiments.

How far the enthusiasts on the theory of intoxication may drift from sound logic is shown in the experiments of Charrin, who reported severe symptoms after injections of distilled water into the veins, in the report of which he says that, "even water is a poison," and he adds a detailed list of our articles of diet, showing how much of this "poison" is contained in each one of them. Natu-

<sup>1</sup> Memorabilia, 1864, p. 140.

<sup>2</sup> Berliner klin. Wochenschr., 1884, No. 24.

<sup>3</sup> Hemmeter, Diseases of the Intestines, vol. i.

rally distilled water may thus be transiently irritating; normal salt solution is not so. In our diet we do not take in chemically pure water, and if we did it would not be absorbed as such.

#### AUTOINFECTION VERSUS AUTOINTOXICATION.

In many cases where the clinician is confronted with a group of symptoms the etiology of which is not at once clear, it is difficult to decide whether he is dealing with an autoinfection or an auto-intoxication. It may be claimed that a febrile course, longer period of incubation, swelling of the spleen, relapses, etc., speak for infection. The toxalbumins and the albumoses, when they are absorbed from the intestinal tract, it is true, do not produce such effects, as a rule. But there are poisons which require a period of incubation of several days before the development of their characteristic symptoms. Again, there are even pure intoxications which may run their course with fever. We are then restricted to the demonstration of inflammation, or of bacteria in the blood, as the only real evidence of the existence of an autoinfection. The intestinal canal, the stomach, and even the mouth contain at all times very large numbers of micro-organisms.<sup>1</sup>

Dr. Harvey Cushing and Louis E. Livingood have asserted that an amicrobic state can be brought about in the gastro-intestinal canal by disinfection of the mouth, lavage of the stomach, taking of sterile food from sterile dishes, etc. The details of their methods are given in "Contributions to the Science of Medicine," dedicated to Wm. H. Welch, p. 574. These observers base their conclusions upon the negative results of cultures either from the contents of the intestine or from the surface of the mucosa. That the gastric and duodenal flora and fauna may be considerably diminished by dietary precautions, disinfection of the mouth, and gastric lavage, there can be no doubt, but that the exemption from peritonitis after any abdominal operation is directly attributable to this partial asepsis is questionable, for in all cases the operators (Halsted and Finney) took every precaution of surgical asepsis to avoid infection. These experiments were conducted with admirable regard for bacteriological technic, and have shown the importance of an amicrobic diet and gastric lavage as preparatory treatment to operations upon

<sup>1</sup> See article "Intestinal Bacteria," in Diseases of the Intestines, vol. i., by Hemmeter.

the gastro-intestinal tract. They have not, in my opinion, satisfactorily demonstrated that the digestive canal may be so far rendered amicrobic as to lessen the need of surgical asepsis. Cultures taken from the surface of the stomach and the surface of the duodenum may be negative, and yet there may be bacteria in the depths of the mucosa. It has been conclusively proved that after sterilization of the human hand by thorough antiseptic scrubbing, etc., the deeper layers of the skin always contain bacteria. I have been able to demonstrate as much in experiments upon the colons of dogs. After lavage of the colon with antiseptic solutions, from an artificial or experimental anus to the true or normal anus, and total exclusion of ingesta from the colon for three weeks, cultures taken from the mucosa of the ascending and descending colon were positive.<sup>1</sup> The difference between my results and those of Cushing and Livingood may partially be explained by the different portions of the gastro-intestinal canal upon which we worked. The duodenum and jejunum are naturally freer of bacteria than the colon, and surface areas may be found in the duodenum which are perfectly sterile to cultures even in the absence of any preparatory amicrobic dieting and lavage. Just what brings about this localized surface asepsis in the intestines under normal conditions is not known, but it seems probable that there is in the intestinal canal a normal disinfecting power, attributable perhaps to substances in the digestive secretions that have an antitoxic action. This natural defence against bacteria may be impaired by medicinal antiseptics, purging, etc.<sup>2</sup>

The bacteria of the digestive tract may cause grave disease phenomena when they enter the system. Desoubry, Nocard, and Porcher have asserted that battalions of micro-organisms penetrate into the lymphatic vessels and blood during the absorption of the food products, but that they are made harmless in the lungs and other organs or excreted with the urine. If the vitality of the tissue is reduced, these bacteria may cause disease. Bouchard and Charrin explain the great majority of all those diseases which are not caused by specific infectious excitants, like gonorrhœa and tuberculosis, by such autoinfection with the bacteria of the mouth

<sup>1</sup> J. C. Hemmeter, "Études expérimentales, etc., Bactéries protéolytiques du Côlon," XIII. Congrès International de Médecine, Paris, 1900, Section de Pathologie interne," pp. 133 to 140.

<sup>2</sup> R. Schütz, Berliner klin. Wochenschrift, 1900, No. 25.

and gastro-intestinal tract. Accordingly these writers may include among the autoinfections pneumonia, meningitis, bronchitis, pleurisy, furunculosis, and otitis; even diphtheria has been classed among the autoinfections, on the ground that the mouth always contains diphtheria bacilli. What paradoxical conclusions such wild hypotheses may lead to may be judged from the expression of Charrin,<sup>1</sup> "Healthy man is enabled to defend himself against the numerous infectious excitants which he continually carries in his organs. *He first becomes sick when he is no longer well.*"

In the second volume of my work on diseases of the intestines I have stated the conditions under which the bowel becomes permeable by bacteria. I might repeat here that under normal conditions the chyle and the blood, as well as all the organs, remain free from micro-organisms, even after ingestion of food which contains abundant bacteria. There are very virulent bacteria which can penetrate the intestinal walls and enter the blood. This is proved by the occurrence of intestinal anthrax in animals and of enteric fever and intestinal tuberculosis in man. In the course of intestinal occlusions and hernias, as well as of gastro-enteritis in children, the blood may contain bacteria which have originated in the intestines. It is conceivable that reduced vitality of the tissues may pave the way for intestinal autoinfection; thus, extreme exhaustion, debility from old age, or abrupt reduction of temperature may facilitate the invasion. Thus the invasion is often a consequence of previous depression of vital powers. Fritsch has made the statement, which is less paradoxical than that of Charrin just quoted, that "laparotomy patients did not die because they became septic, but *they became septic because they died.*"

The conclusion that diphtheria or erysipelas in any particular case is an autoinfection, because streptococci or diphtheria bacilli are found in the mouth of normal individuals, is not absolutely correct. It fails to take into consideration the distinction between pathogenic and non-pathogenic micro-organisms of the same species. A large number of the micro-organisms of the mouth and intestine do not grow on common culture-media, hence little is known of them. The latest investigations of Escherich have shown that it is not probable that the harmless form of the colon bacillus may

<sup>1</sup> Verhandlungen des Congresses f. innere Medicin, Wiesbaden, 1898, p. 158.

become virulent; in all cases of grave enteritis or cholera nostras there is greater probability, or even certainty, that the virulent bacteria were introduced in the food from the exterior and did not develop from the harmless form normally present. *The organism has become largely immune to the products of such bacteria as are normal inhabitants of its intestinal canal.* In the etiology of infections much more importance must be attributed to the introduction of bacteria and their products from the outside than to those saprophytes which are normally present in the intestines. We may distinguish these various infectious agents as the *imported* and the *domestic* micro-organisms, the latter being those which are normally present in the intestinal canal. In my opinion, the products of the domestic saprophytes rarely become dangerous to the human organism.

#### CRITICISM OF THE CLINICAL ARGUMENTS IN FAVOR OF AUTOINTOXICATION.

The recognition of intestinal autointoxication has been based upon (1) the manifestation of gastro-intestinal disturbances and (2) attempts at demonstration of toxic products in the urine and blood, as well as (3) efforts to demonstrate that the extracts made from faeces, urine, and gastric juice were toxic when injected into experimental animals. Conservative critical judgment of these three main supports for the diagnosis of intestinal autointoxication shows that they are extremely variable factors. In the first place, if a disease has begun with vomiting and diarrhœa, this by no means shows an autointoxication, for these gastro-intestinal disturbances may occur secondarily in all infectious disorders. The presence of an excessive amount of ethereal sulphates and indican has been taken as an indication of autointoxication, but v. Pfungen, Albu, and myself have shown the fallacy of this supposed criterion. The amount of ethereal sulphates and indican depends upon the frequency and volume of the evacuations, and it is one of the most variable factors in clinical pathology. It is true, the ethereal sulphates are the product of albumin putrefaction in the intestine; but the combinations of the products of albumin break-down with sulphuric acid show very little toxic property: they may be present in large quantities in the urine without any autointoxication symptoms. The speculations which attribute migraine, epilepsy, skin

diseases, and chlorosis to intestinal autointoxication, because the conjugate ethereal sulphates are abnormally increased in the urine, are devoid of objective proof. Many of the symptoms hitherto attributed to autointoxication from the intestine are identical with those which were formerly classed as due to a "reflex." An interesting polemic sprung up at the Sixteenth German Congress for Internal Medicine (Wiesbaden, 1898) as to which symptoms could be regarded as due to reflex and which to intestinal autointoxication. Much of this polemic consists of hair-splitting discussions without practical end. Some symptoms, however, follow so promptly upon well-known causes other than autointoxication that we must of necessity classify them as reflexes. For instance, when Beaumont touched the wall of the stomach of the wounded hunter, Alexis St. Martin, with a thermometer, he could produce vertigo, pallor of the face, fainting, and obscurity of vision. No change was observable in the stomach itself while these systemic effects were produced. This can hardly be termed anything but a reflex. Such phenomena occur rapidly, and, as a rule, follow promptly upon the irritation that provokes them. If, then, we wish to assign similar phenomena to intestinal autointoxication, we will have difficulty in explaining the promptness of their occurrence when we consider the slowness with which such toxines pass the intestinal wall and liver.

#### PROTECTIVE FUNCTION OF THE LIVER.

The liver offers a strong barrier to the entrance of toxic substances. In order to understand what the organism suffers when the functions of the liver are lost or eliminated, we will have to know all those useful and beautiful things which the liver accomplishes when in a state of perfect health. Unfortunately, those functions are imperfectly understood. But judging even from those few well-ascertained facts that we are, fortunately, in possession of, we can readily conceive that the human liver is an organ secondary in importance only to the heart. Living things can do without stomachs; they can live for forty days without eating at all; but a mammal can live only a few days, sometimes not twenty-four hours, without a liver.

I shall not discuss the hepatic secretion and excretion of bile, the formation of glycogen, and the generation of urea, three functions of far-reaching importance. I shall not even speak of its

digestive, nutritive, and assimilative functions. A very large part of the albuminous products of gastric and intestinal digestion undergo, as it were, a secondary digestion and transformation in the liver. We may regard this organ as passing judgment upon these products,—whether or not they are fit to enter the general circulation for absorption by the cells of the various tissues. The portal circulation brings a large variety of digestive products from the intestinal canal which undergo further chemical changes in the hepatic parenchyma. If the gastric and intestinal digestion be so abnormal that the results of this digestion in the alimentary tract furnish incomplete bodies, substances immature and uncongenial to the cells of the tissues, the liver, in its efforts to reform them, may become overworked. In certain intensely infectious diseases,—like dysentery or typhoid fever,—the products of bacterial decomposition will be added to those of a defective digestion, and a condition of absolute loss of function of the liver may supervene. I have spoken of this as “paralysis of the liver.”

*The “Dyspeptic” Liver.*—A few years ago Bouchard and Hanot called attention to a peculiar enlargement and induration of the liver which occurred in the course of chronic gastric and intestinal dyspepsia. Of course, in a case of enlargement of the liver we think first of alcoholism and then of cholelithiasis and cholangeitis. If we can exclude these, we may think of tuberculosis, carcinoma, and syphilis. Personally I have encountered enlargements and indurations of the liver in the course of colitis or gastritis which disappeared when these conditions were cured. These hepatic enlargements could not be attributed to any of the other causes mentioned. Bouchard asserts that he has found enlargement of the liver in twenty-three per cent. of all his cases of dilatation of the stomach. I do not find hepatic enlargement with dilated stomach as frequently as Bouchard asserts, but in perhaps ten per cent. of the cases. This so-called “liver of the dyspeptic” shows remarkable variations in size, under the influence of diet and cleansing of the gastro-intestinal canal. For instance, a carefully sterilized diet, such as boiled milk and boiled beef, together with lavage of the colon and stomach, with bodily and mental rest, will very often cause a reduction in size. Boix has shown that lactic, butyric, and acetic acids, when fed to experimental animals for a long time, may lead to a genuine cirrhosis of the liver. These acids are among

the most common and frequent results of abnormal gastro-intestinal digestion, and I see no reason why they may not cause hepatic irritation with consequent hyperaemia in human beings if they pass through the liver parenchyma for years.

The dyspeptic liver is, in my experience, not a frequent disease. For instance, in sixty-four cases of hepatic cirrhosis only four could not be attributed to the other causes before mentioned. It is not important because of its frequency, but it is most interesting that such a dyspeptic hepatic enlargement should occur at all.

Hanot and Boix ascribe this hepatic enlargement to chronic intestinal autointoxication. It is well known that the liver is sympathetically affected in all intestinal infections and intoxications. There is an acute yellow atrophy of the liver which results from sausage poisoning, and there is an epidemic icterus of gastro-intestinal origin. The so-called Weil's disease, as far as we understand it at present, is a febrile icterus in combination with nephritis, which may run its course with severe disturbances of the central nervous system and terminate fatally. The liver changes may be due to toxic influences, because bacteria have not been found in the organ in many such conditions. Czerny and Thiemich have called attention to the frequent association of fatty liver with gastro-intestinal catarrhs of children, but, as this fatty liver may occur in any of the wasting diseases, it is doubtful whether it can be attributed to intestinal autointoxication.

The observations of Schiff, Hegar, and Roger on the protective function of the liver, by which it converts toxalbumins and other toxines into harmless substances, have been confirmed experimentally by Nencki and his school, who found that after exclusion of the liver from the circulation toxic symptoms were caused, especially when albuminous foods had been ingested. Rovighi says, "Like unto Minos in Dante, the Liver tests the conscience of those that want to enter, and knows their sins."

#### CAN CHRONIC CONSTIPATION CAUSE INTESTINAL AUTOINTOXICATION?

This is a much-disputed point. In a very large number of cases which I have carefully studied with regard to this question, I have not found one in which symptoms of autointoxication could be assigned to chronic constipation pure and simple. It is not plausible

to assume that a condition which solidifies and condenses the fecal matter should predispose to constipation, but, when constipation coexists with diarrhoea, or where the hardened fecal matter exerts such an irritating effect upon the intestinal mucosa that enteritis and colitis are set up, in circumscribed areas at least, then we have more reasonable grounds for assuming self-poisoning. Bouchard<sup>1</sup> regards constipation as a protection against autointoxication. He presumes that all that can be absorbed has been absorbed. Albu,<sup>2</sup> who is otherwise an enthusiastic supporter of the new theory, is doubtful whether the consequences of chronic obstipation can be attributed to autointoxication. A similar view is held by Illoway.<sup>3</sup> On the other hand, Friedrich Miller,<sup>4</sup> who gives a very scholarly criticism of the modern literature on intestinal autointoxication, seems inclined to believe that the neurotic symptoms which sometimes accompany constipation are due to autointoxication, his main argument being that the headache and neurasthenic condition can be relieved by a laxative. He also gives a most logical analysis of the reflexes which may emanate from the gastro-intestinal tract,<sup>5</sup> and even refers to the experiment of Beaumont which I have just recalled. From his own argument I would preferably conclude that the nervous accompaniments of obstipation are of reflex origin.

There is no sound logic or objective proof thus far offered in medical literature to justify our assuming that chronic constipation may cause intestinal autointoxication.

#### TYPE OF INTESTINAL AUTOINTOXICATION.

In the literature of this subject frequent mention is made of an interesting group of acute attacks which are regarded as a type of intestinal autointoxication. These cases are described as presenting the following symptoms: violent gastro-intestinal peristalsis, with vomiting and diarrhoea, or in rare cases constipation, enteralgia, tympanites, coated tongue, headache, obscured consciousness, occasionally urticaria and erythema. Sometimes there is fever. Even

<sup>1</sup> Les Autointoxications, p. 165.

<sup>2</sup> Ueber die Autointoxicationen, etc.

<sup>3</sup> Constipation in Adults and Children, p. 175.

<sup>4</sup> Intoxicationen Intestinalen Ursprungen, Verhand. XVI. Inner. Med., p. 165.

<sup>5</sup> Loc. cit., p. 168.

slight icterus and albuminuria are reported in connection with this clinical picture, which resembles that following the ingestion of decayed or poisoned food. Such cases have been very unsatisfactorily described hitherto. Above all things *we need exact clinical descriptions for such groups of symptoms, before we are able to classify them.* It is not even possible to decide whether they are due to infections or to autointoxications.

It is well known that it requires a much more thorough elaboration to eradicate an error that has once taken hold of the medical profession than to spread a new hypothesis. The higher up in the air a theory is, the more difficult it is to disprove. This can be said of the assertions which assign rhachitis, leukaemia, and many skin, nervous, and muscular diseases to autointoxications.

(To be continued.)

# Surgery

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## COXA VARA.

CLINICAL LECTURE DELIVERED AT THE ABERDEEN ROYAL INFIRMARY.

BY JOHN MARNOCH, M.A., M.B., C.M.,

Surgeon to and Lecturer on Clinical Surgery at the Royal Infirmary, Aberdeen.

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GENTLEMEN,—I can show you to-day an excellent example of a malady which is not very common and which has been recognized as a disease *per se* for but little more than a decade,—namely, coxa vara. The history which the patient gives of his trouble is briefly as follows: About eighteen months ago he felt pain of a shooting character in his right hip-joint and extending down the front and back of his thigh as far as the knee. His occupation, that of herding cattle, necessitated his being a good deal on his legs, and soon the pain became aggravated and caused him to limp. Whenever he rested the pain almost entirely disappeared, only to return, however, when he got up to walk about. He persisted at his work for six months, when he was obliged to take to bed, being unable to get about without much pain and discomfort. After resting for a fortnight, he found, on rising, that his symptoms had abated so far as to admit of his resuming his occupation. His pain and limp soon returned with renewed severity, and similar symptoms began to appear in the other hip-joint, so that, a year after the commencement of his illness, he was able to walk only part of the day, and that with the aid of a stick. In this condition he was admitted to the hospital.

Now look at the lad, and you will notice that he is tall for his years, for he is only fourteen, and exceedingly well nourished, his lower limbs being particularly well developed. The nates and gluteal folds on both sides are quite normal in appearance and healthy, in marked contrast to what you find in tubercular disease of the hip-joint; indeed, he has none of the look of such cases. There is

some beading of the fifth, sixth, and seventh ribs, especially of the sixth, which can be better felt than seen. There is besides a well-marked lordosis of the spine (Fig. 1), and also you will observe slight knock-knee. His easiest position in bed is lying on his back with his left lower limb crossed over in front of the other one (Fig. 2),—that is to say, he is most comfortable when his thighs are adducted. If you attempt to remedy this deformity by abducting the limbs, you will with difficulty be able only to get them to lie side by side, further abduction being impossible. Adduction is unimpaired and there is fair power of flexion; but you will notice that, as you flex either limb, as soon as the foot reaches the level of the knee on the other side rotation outward at the hip-joint takes place to some extent and then the flexion movement is continued. This symptom was pointed out by Professor Ogston, who was a pioneer in the recognition and study of coxa vara. The net result of this combination of rotation outward with flexion is that flexion of both limbs at the same time increases the scissors-leg deformity. The arc of rotation, however, is greatly impaired, being not more than ten degrees in extent on the left side and fifteen degrees on the right. Both limbs are very much everted, but are of the same length,—namely, thirty-four inches,—the apparent shortening on the left side being due to tilting of the pelvis.

Now map out Bryant's triangles on each side and note the result. I would here emphasize the fact that Bryant's triangle furnishes a method of estimating not merely the amount of shortening at the hip-joint but also the amount of eversion, and it is understood that the terms "horizontal" and "perpendicular" in connection with the sides of the triangle are used with reference to the patient in the recumbent position. The normal Bryant's triangle, as you are aware, is a right-angled isosceles triangle, the perpendicular and horizontal sides being equal, but in this patient, on the left, the perpendicular side measures five and one-half inches while the horizontal measures only two and seven-eighths inches (Fig. 3); on the right the perpendicular is four inches while the horizontal is one and three-quarters inches in length (Fig. 4). What, then, is the cause of the disproportion between the sides of the triangle? In most cases where Bryant's triangle is used, as for example in fracture of the neck of the femur, one has the sound side for comparison, and you can estimate at once the amount of shortening



FIG. 1.—Patient in erect posture, showing lordosis of the spine, slight knock-knee, and Bryant's triangle outlined.

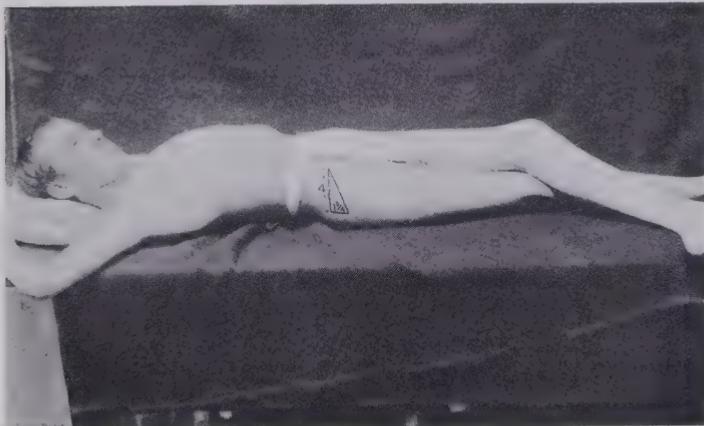


FIG. 2.—Position of greatest comfort, with thighs adducted and Bryant's triangle outlined.

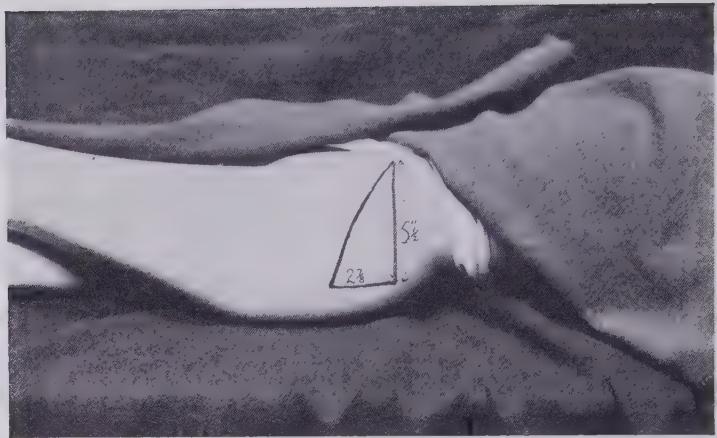


FIG. 3.—Patient recumbent, showing Bryant's triangle on the left.

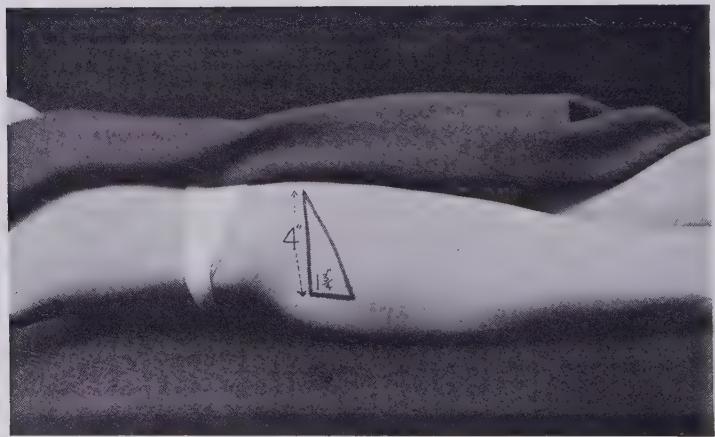


FIG. 4.—Patient recumbent, showing Bryant's triangle on the right.

or eversion. Not so in the present case, as Bryant's triangle on neither side is normal. Eversion causes lengthening of the perpendicular side of the triangle, while shortening reduces the length of the horizontal side. Now, we know that the perpendicular side in this case must be lengthened, because of the marked eversion which we noted, and the skiagraphs show very pronounced bending of the neck of the femur with corresponding elevation of the trochanter major, thus producing shortening; so that the disproportion between the sides of the triangles is due to a combination of rotation outward and shortening. Neither the rotation outward nor the shortening, however, has taken place to the same extent on both sides, and I have no doubt that the fact that the limbs are of the same length, measuring from the anterior superior spines to the tips of the internal malleoli, is to be accounted for by variation in the extent of the knock-knee between the sides. Tapping the heels elicits no pain and Thomas's test is positive, showing a certain amount of insuperable flexion of the thighs.

Perhaps the patient's most striking symptom is in his gait. On account of the adduction of both thighs, with inability to abduct them beyond the point referred to, he is unable to move one knee past the other, and his mode of progression is as follows: he advances a step forward with his left limb and then brings the right one up behind until the right knee almost touches the popliteal space of the left, and so on. When his limbs are close together, previous to taking a forward step, the toes of his right foot nearly touch the heel of his left foot at an angle of ninety degrees, thus showing the amount of eversion (Fig. 1).

A critical examination of the skiagraphs reveals a marked bending of the neck of the femur on both sides. The upper border of the neck, instead of being concave, is decidedly convex, and the angle which the axis of the neck makes with the axis of the shaft is reduced from one hundred and thirty-five degrees to about ninety degrees.

This, then, is a case of bilateral coxa vara, and the symptoms are such that you are not likely to mistake the disease for any other. You will not always, however, find the diagnosis so easy. It is most liable to be confounded with tubercular disease of the hip-joint, but I would lay stress upon the following points as helpful in distinguishing them. First, the combination of ab-

duction with rotation outward of the limb, so characteristic of early tubercular hip disease, is never found in coxa vara, where adduction is always combined with rotation out. Secondly, actual shortening is a late symptom of tubercular disease and indicates destruction of the head of the bone or of the acetabulum, whereas this symptom is present almost from the very commencement in coxa vara and is due to bending of the neck of the femur. Thirdly, in tubercular disease the motions of the joint are more or less impaired in all directions by reflex muscular spasm, while in coxa vara only certain motions are impaired, notably abduction and rotation, and here the impairment is purely mechanical. In the case before us, for example, the loss of abduction is doubtless due to the neck coming directly into contact with the upper border of the rim of the acetabulum on attempting that movement.

As regards the etiology of coxa vara two points are worthy of mention. In the first place, in about one-third of the recorded cases evidences of early rickets have been found; in the second place, the disease occurs in most cases during the period of adolescence, and is evidently due to disproportion between the weight of the body and the ability of the neck of the femur to support it. A mechanical factor predisposing to the deformity is a lessening of the angle between the neck and the shaft of the femur, which appears to be, in many instances at any rate, the effect of early rickets. Certainly in this lad the disease seems to be a manifestation of rhachitis adolescentium, for he has the other evidences of rickets which I pointed out to you,—namely, the beading of the ribs and knock-knee,—both slightly marked, it is true, but still there.

The treatment which I intend to adopt here is cuneiform osteotomy, or removal of a wedge of bone from the shaft of the femur at the level of the trochanter minor. In this operation the wedge should have its base outward, so that, when removed and the gap closed, the limb will be in a condition of abduction. In this position plaster of Paris is applied from the toes well over the pelvis until union occurs, when it is removed and the limb brought into its normal position. The deformity here is so considerable that the operation will have to be performed on both sides.

## ECTOPIA TESTIS.

BY DAVID M. GREIG, C.M., F.R.C.S. (Edin.),

Dundee, Scotland.

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ECTOPIA TESTIS, though well known, is a comparatively rare condition. It is due to causes connected with the passage of the testis from the abdomen to the scrotum in the foetus. The term "descent" applied to this migration of the testicles is an unfortunate one, for it implies that the organ passes from above downward, and suggests the action of the force of gravity. Clearly, gravitation can have nothing to do with it, for in the foetus in utero the scrotum most frequently lies at a higher level than the loins, where the testes are originally formed. The migration, therefore, is really an "ascent," not a "descent," and the term "retained" is preferable to "undescended," which is the word commonly employed to describe imperfect transmission. In ectopia testis the transmission is complete but takes place in an abnormal direction, whereas in retentio testis the transmission is incomplete but takes place in the normal direction.

The transference of the testicle from the infrarenal region is effected by the gubernaculum testis. This is a musculo-fibrous band attached above to the vas deferens, epididymis, and testicle, and below to (first and chiefly) the bottom of the scrotum, (second) the perineum in the fascia about the sphincter ani, and (third) the thigh below the crural opening. Under ordinary conditions of development the testis follows the first of these routes, and arrest anywhere in its course is followed by retention of the testicle. The band of the gubernaculum which directs this transmission to the scrotum is in most cases more developed than the bands passing elsewhere, but if this band be imperfectly developed, or if any of the other bands be abnormally developed, the testis may be drawn elsewhere than to the scrotum,—as into the perineum or into Scarpa's triangle. The two following cases exemplify both these abnormal conditions.

CASE I.—*Perineal Ectopia Testis.*—Peter S., aged five weeks,

was brought to me with a swelling to the right of the mid-perineal line, just behind but quite clear of the scrotum. It had been noticed at birth. He was one of several children, all of whom were reported to be healthy. The genitals were well developed, but the right side of the scrotum was empty. The swelling complained of was rather larger than a marble; the skin over it was stretched and slightly translucent in appearance. The cord could be felt passing from the external ring downward by the side of the scrotum. It was evident that the condition was one of perineal ectopia with some degree of infantile hydrocele.

The operation consisted of an incision from the lower pole of the swelling upward along the cord till the base of the scrotum was reached. The testicle and cord were then isolated, the parietal layer of the tunica vaginalis testis was pricked to allow of the escape of the hydrocele fluid, and the testis and cord were raised and placed in the scrotum. A catgut suture through the lowest part of the scrotum and the tunica albuginea of the testicle held the organ in its place. The incision was then closed by catgut sutures and the whole freely dusted with boracic acid. For the next two or three days the child had some pain apparently and the testis was somewhat swollen. The wound healed within a fortnight, the testicle remaining in its proper place. Two weeks later the child developed a marked attack of congenital syphilis, through which he passed without any untoward occurrence around the site of the operation. I am unable to say whether the orchitis which followed the suturing in any way affected the subsequent growth of the testicle, for I lost sight of the case a few months after the operation.

CASE II.—*Crural Ectopia Testis*.—P. C., aged twenty-one years, a blacksmith, was referred to me by Dr. W. E. Foggie. His complaint was that, on account of a congenital abnormality, he had failed to satisfy the medical officer who had examined him as to his physical fitness for active service with the volunteer company of the Black Watch, then about to proceed to South Africa. I found him to be an exceptionally well-made, powerful lad, with a faultless family and personal history. His penis and left scrotum and testis were well developed and normal. The scrotal raphe was distinct, but the right scrotum was "undeveloped" and empty. At the inner side of his right Scarpa's triangle, separated from the





FIG. 1.—Crural ectopia testis, before operation.



FIG. 2.—Crural ectopia testis, after operation.

scrotum by the perineo-femoral cleft, was an oval swelling the size of a hen's egg, containing besides the right testis a reducible femoral hernia. The cord could be felt passing up through the femoral ring. Fig. 1 shows the appearance of the tumor and how the long axis of the swelling was from above downward and inward. The skin covering the swelling was normal and the hernia gave an impulse on coughing.

When I operated the hernia had gone up, as the patient was in the recumbent position. A T-shaped incision was made over the tumor, the transverse limb crossing the inner end of Poupart's ligament obliquely. The testicle was then exposed and, together with the cord, separated from the patent processus funicularis. Though the testicle was slightly smaller than the left, it was so well developed that no question of its removal was thought of. The finger was next introduced into the femoral ring, the tip placed at the site of the inguinal canal, and an incision made on to it through the conjoined tendon. A pair of forceps was then introduced through this incision and protruded through the crural canal, and the testicle drawn up through the crural canal into the abdominal cavity and thence through the inguinal incision and placed in the collapsed right scrotum, where it was retained by a silkworm-gut suture through the tunica and the scrotum. The twisted neck of the sac was then ligatured at the femoral ring, and the canal closed by splitting Gimbernat's ligament and suturing it to the pectineal fascia. The subsequent course of the case was not quite aseptic, but that did not interfere with the ultimate perfect result, which is shown in Fig. 2.

The first of these cases illustrates the most common variety of ectopia, while the second is a much more rare condition. Professor Sebileau<sup>1</sup> gives the varieties of ectopia testis at greater length than British or American authors. His classification is as follows:

1. Retrovesical ectopia, when the testis lies in the true pelvis behind the bladder.
2. Crural ectopia: (a) Deep, when it lies below the cribriform fascia internal to the femoral vein. (b) Superficial, when it lies in the superficial fascia.
3. Cruro-scrotal ectopia, when it lies in the cruro-scrotal fold.

<sup>1</sup> Dentu et Delbet, *Traité de Chirurgie*.

4. Anterior pubo-penile ectopia, when it lies in front of the pubis at the root of the penis.
5. Penile ectopia, when it lies under the skin of the penis.
6. Subabdominal ectopia, when it passes through the inguinal canal and then turns into the subcutaneous tissue of the abdominal wall some distance from the external ring.
7. Perineal ectopia.

If this classification has the advantage of fulness, it has the disadvantage of complexity, and except the retrovesical form these are only varieties of the three forms usually described.

I do not know which is the side usually affected. Both my cases were right-sided abnormalities, and one might, *a priori*, consider this to be the more likely. Certainly, as regards retention of the testicle, the right side is more often affected than the left. Thus, in fourteen cases of retentio testis of which I have notes, the retention occurred on the right side in eleven and on the left in two cases, while in one case the retention was bilateral.

In the reports of cases in which the testis has not entered the scrotum the latter is usually described as undeveloped. This is erroneous; the scrotum in these cases is developed, but being empty is simply not distended.

It is well known that the infantile characteristics persist in cases of retained testes in the adult, but in ectopia there seems to be a better, if not a normal, development of the testis, and though in the former its uselessness may justify its removal, it will be advisable in the latter not to sacrifice the organ unless some unusual complications prevail.

**A PRIMARY EVIDEMENT OF TUBERCULAR FOCI AT  
THE KNEE; SUDDEN DEATH AFTER ENUCLEA-  
TION OF THYROID GLAND FOR EXOPHTHALMIC  
GOITRE; SUPPRESSION OF URINE AND HEMOR-  
RHAGE AFTER OPERATION FOR GALL-STONES;  
A CALCULUS IN THE APPENDIX MISTAKEN FOR  
URETERAL CALCULUS.**

PRESENTED BEFORE THE CHICAGO SURGICAL SOCIETY.

**BY BAYARD HOLMES, M.D.,**

Professor of Surgery in the University of Illinois, Chicago.

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**A PRIMARY EVIDEMENT OF TUBERCULAR BONE FOCI AT THE  
KNEE IN THREE CASES.**

THE three patients whose cases I wish to recount are all who have come to me in condition to require the operation which I propose and who consented to it before the disease had progressed too far to permit its use. The diagnosis was made in several other cases, but the parties either passed out of my reach or they declined an operation, and several of them have since been obliged to submit to resection or amputation on account of the progress of the disease.

*CASE I.—Tubercular Osteitis of the Median Side of the Left Knee; Extracapsular Evidement of the Bone Foci in the Femur and Tibia; Recovery; Tuberculosis of Opposite Knee after Three Years; No Operation.*—Miss W., aged twenty-two, was brought to me by her brother, who was a physician, in June, 1890. She was well built and well developed; had always suffered from diseases of the nose and throat, but had otherwise been well. She menstruated regularly. She had a good appetite, and was in good spirits. Her only complaint was of pain, stiffness, and swelling of the left knee, of slow onset and three years' duration.

The left leg was found to be distinctly smaller than the right. The knee, however, was considerably larger than the sound one. The configuration of the joint was partially lost. The swelling was almost entirely on the median side of the femur, extending down-

ward over the tibia. On palpation, the patella was found to be free, without tenderness. It would not float. There was no evidence of any considerable fluid in the joint. The semilunar cartilages at their attachment to the capsule of the joint were not tender. A distinct focus of oedematous periosteum and great tenderness were found on the median side of both the left femur and the left tibia. This condition was noticed and recorded on several examinations, days apart. The lymph-glands in the left groin were enlarged; those in the right groin were scarcely palpable.

At each succeeding examination a map of the knee was carefully sketched, and the measurements taken from time to time were compared with those made at the first examination. After more than two months of rest on crutches and immobilization by means of a Bavarian splint, I believed that I had located two tubercular foci in the ordinary locations on the median side of the epiphyses of the femur and tibia and directly opposite each other (Fig. 1).

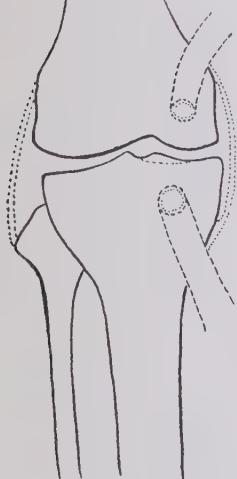


Diagram of knee, showing osteal foci.

In the middle of August, 1890, with the consent of her brother and at her own anxious solicitation, I undertook to remove these two supposed foci by means of an incision behind the capsule of the joint. The patient had been prepared in the usual way and was anaesthetized with chloroform. The focus in the femur was approached by an incision through the skin, fat, and fascia, parallel with the femur and just above the epiphysis. The capsule of the joint was pulled down with a blunt retractor, and, with a sharp Volkmann spoon about eight-tenths of a centimetre in width and a centimetre in length, a hole was carefully bored through the side of the epiphysis outward and downward towards the supposed focus. The bone was found osteoporotic, and, encouraged by this finding, I pursued the focus to its ordinary site. When it was reached, it came out whole, surrounded with a mass of gray granulation tissue, which was distinctly tubercular in appearance. This cavity was very carefully scraped out with the sharp spoon. The surrounding bone was

exceedingly soft and fatty. The point of the spoon in one place removed a bit of the articular cartilage. The cavity was carefully washed out with a strong solution of iodine and packed with sterilized iodoform crystals as high as the fascia covering the bone. On account of the continuous hemorrhage, the skin wound was left partially open, and the space between the periosteum and the skin was drained by means of a wick of sterilized iodoform gauze. A like incision was made over the supposed focus in the tibia, which was reached more directly by a similar evidement. After careful packing with sterilized iodoform, the skin over this wound was closed without drainage. The whole leg was covered with a large antiseptic dressing and immobilized in a Bavarian splint.

During the next three weeks the dressing was not removed. The temperature was normal and there was no considerable pain in the leg after the first few hours. The drainage from the upper wound was found at the first dressing thoroughly incorporated in the tissues, making it necessary to extract it with some force.

In the following October the knee was apparently of the same size as the sound one; the calf was still smaller than the right calf, and the patient was able to walk upon it without much pain. There yet remained some limitation of motion: the extension was hardly complete, and the leg could with difficulty be flexed to an angle of one hundred and fifteen degrees. The following year she spent in the Raton country of Colorado and New Mexico, and walked without a cane, rode horseback, and in every way appeared to be well. She returned to a lower altitude, and began to suffer in the right knee as she had in the left. A satisfactory examination, however, was not obtained. The subsequent progress of the disease in the right knee is unknown to me.

*CASE II.—Tuberculosis of the Right Knee beginning at the Age of Fourteen; Diagnosis of Foci in both Sides of Epiphysis of Femur and Median Side of Epiphysis of Tibia; Immobilization for Two Years; Inspection of Knee-joint; Evidement; Complete Recovery and Normal Function of Leg; no Return.*—Miss H., aged eighteen, of English parentage, born and bred in central Illinois, was perfectly well until she was fourteen. About that time she suffered from some infectious disease, probably measles. She coughed during most of the winter and in the spring gradually became lame in her right knee. It swelled excessively, causing her

much trouble at night, and for four years obliged her to go in a wheel-chair or go-cart. In the spring of 1892, when eighteen years of age, she worked at the World's Fair. She went from her house to her office in a wheel-chair, and about her room on crutches, never touching her foot to the floor. She slept with her right knee on a pillow, but was frequently kept awake during the night by the pain in her leg. She often lost appetite and strength for a time, but continued at work. In the spring of 1893 I saw her, and made a diagnosis of a tubercular focus on each side of the epiphysis of the femur and probably on the median side of the epiphysis of the tibia about the knee-joint. I drew a picture of these foci on each of the several examinations, a week or more apart (Fig. 2).

FIG. 2.

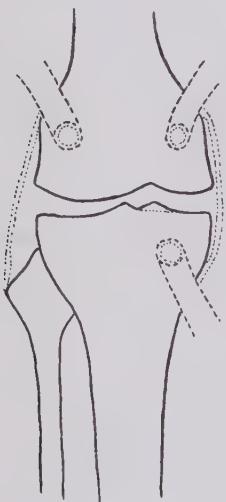


Diagram of knee and osteal foci.

FIG. 3.

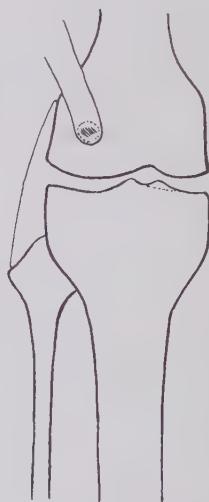


Diagram of the knee made six years before X-ray picture and operation.

Because of the pain on motion, with the slight amount of oedema of the capsule and the loss of all configuration of the joint, I was afraid that one of the foci had already broken through the articular cartilage and had infected the synovial membrane; therefore, I decided to try immobilization, and applied a plaster-of-Paris splint extending from the thigh to the ball of the foot. She wore this cast for several months, with some improvement, and during the subsequent two years the knee improved in every particular, but it was

still impossible to leave off the cast without immediate loss of all that had been gained.

In January, 1895, after repeated observation and after every effort to build up her general health, I undertook to reach the foci in the same manner as in Case I. Being doubtful as to the condition of the joint, I first made an exploratory incision on the median side of the patella, and carefully inspected for a moment the articular surfaces of the femur and the synovial membrane of the joint. They seemed to me to be entirely free from disease, and I quickly closed this incision by means of fine catgut stitches. Then, by means of an incision as far as possible from the joint, and with the same sharp spoon that I had used before, I approached the three foci which I had fixed upon. The loosely attached and thickened periosteum encouraged me to proceed. I found the bone osteoporotic and fatty-degenerated, and the foci were easily recognized and painstakingly removed. The cavities were washed out with iodine solution and filled to the periosteum with sterilized iodoform crystals. On account of oozing, the external wounds were drained with iodoform gauze for three or four days. The portions of the wound not needing drainage were closed with deep and superficial stitches. The patient suffered extremely from the anæsthetic, her temperature rose to 100° F., and albumin appeared in the urine. After two or three anxious and painful days she recovered herself, the urine became free of albumin and casts, and the subsequent progress of the case was most satisfactory. There never has been any pain in this knee since that time.

In January, 1896, she was walking about with a cane; since January, 1897, she has abandoned the cane and is able to flex the knee sufficiently to walk without a noticeable limp. She has continued her professional work, which is quite exacting, and has married, feeling herself perfectly well.

*CASE III.—Tuberculosis of the Lateral Side of the Left Knee; Diagnosis of Osteal Focus in the Outer or Lateral Side of the Femur; Climatic Treatment for Six Years; Pregnancy; Exacerbation of the Disease; Extracapsular Evidement; Recovery.*—Mrs. A., aged thirty-eight, consulted me in 1895 for the left knee, which had troubled her for three or four months. The knee was slightly injured in a bicycle ride, but not enough to require any treatment at the time. About a month later she noticed that it was painful and

swollen, and called a physician, who pronounced the trouble a slight rheumatism, gave remedies, and advised rest. In the following three or four weeks the knee gradually grew worse, becoming more swollen, more tender, and at last she could not completely flex or extend it. Walking became impossible; a cast was put on, and rest enjoined.

When I saw her, the left calf was noticeably smaller than the right, the left knee larger than the right, and the inguinal glands in the right groin were considerably enlarged. The patient was a brunette, had suffered from an ovarian tumor, was the mother of one child, now four years old, and had never considered herself strong, but always well. She seemed to be distinctly enervated, was much troubled by her crutches and her inability to walk and ride the bicycle. I made a map of the knee, showing a focus on the median side of the femur (Fig. 3). I advised removal of the patient to a better climate for the winter, and only moderate exercise of the knee, the use of crutches, but the abandonment of all fixtures on the limb, because of their weight and the inconvenience to the patient.

The following spring she returned from California much stronger and feeling little inconvenience from the knee. I examined the limb again, making the same diagnosis as before. I recommended the ordinary use of this leg, the abandonment of all crutches and canes, and occasional exercise on the bicycle. Everything went well until April, 1901, when she consulted me once more for increasing pain, tenderness, swelling, and stiffness in the joint. Again I made an examination and a map of the joint, showing a focus in the median side of the lower epiphysis of the femur. After returning home, I compared this drawing with the one made six years before; they corresponded exactly.

A few weeks later I found that the condition of the knee had gradually grown worse, and now there was evidence that she was three months pregnant. This pregnancy had perhaps aroused the dormant tubercular focus. I recommended that an X-ray picture be made of the knee, and, should it sustain my diagnosis, that the focus be removed, because the operation would be less harmful to the patient than her inability to exercise during the remainder of gestation. The picture which was taken by Mr. Fuchs is herewith presented (Fig. 4). It showed a focus, not quite so large as that seen in my drawing, but nevertheless distinct and definite, on the



FIG. 4.—Skiagraph showing location of bone focus.



median side of the epiphysis of the femur. Reinforced by this means of diagnosis, I operated upon her knee, under chloroform anaesthesia, on the 15th of May, at the Baptist Hospital, Dr. J. E. Raycroft assisting. I approached the focus as in the preceding cases, and found the periosteum loose and the bone osteoporotic and fatty-degenerated, though in a less degree perhaps than in the other cases. The focus, however, was much more distinct, and was surrounded by a rather firm mass of sclerotic bone. It was easily removed entire by a single turn of the Volkmann spoon.

Careful examination showed that it was a sequestrum, almost a centimetre in diameter, composed of the original bone and a thin coating of granulation tissue, in which the bacilli were sparingly found. The granulation tissue itself contained many typical tubercles, apparently of moderate activity, with a large number of cells undergoing an active mitosis. The cavity was filled with sterilized iodoform crystals and the outer skin wound was drained for a few days with iodoform gauze. The leg was kept at rest for about three weeks. Since that time the knee has been entirely painless, the pregnancy has progressed to a favorable termination, without any limitation from her lameness, and outside of a few trifling complications of pregnancy she has been perfectly well.

#### SUDDEN DEATH AFTER ENUCLEATION OF THE THYROID FOR EXOPHTHALMIC GOITRE.

The following case is the only one, out of nine successive cases of exophthalmic goitre operated upon, in which I have had any accident, and in which I have failed to secure the most flattering improvement or cure. I think it ought to be reported, although the history is not as complete as I should like. The operation was performed with the greatest possible care in manipulating the thyroid. The gland was enucleated; the ligatures were applied in two pieces on each side, and the pedicle was cut off with a scalpel, so as to avoid any pressure which might force the gland secretion into the lymphatics.

Mrs. R., born in Missouri, twenty-five years old. Her mother nursed her until she was a year and a half old, and she spent her childhood in a town of less than eight thousand inhabitants. She was a strong, active, but not very rugged girl. She was not particularly nervous, but always joyous and fun-loving. She had whooping-

cough for a short time, but was not very sick. She had a slight attack of measles when she was about ten years old. At the age of six years she began to attend school regularly and to learn to play the piano. When sixteen years old she went to a boarding-school for two years; she was always well there. Her menstruation commenced at thirteen, and recurred somewhat irregularly with pain until after her marriage, three years ago; on these occasions she was confined to bed for a day or two. Since her marriage she has not been pregnant, although there is no apparent reason why she should not have become so.

In June, 1898, she had *la grippe* while in Chicago. During this sickness she vomited considerably, but does not believe that she had any chills. She was under the care of Dr. O'Byrne for ten days. She afterwards went to her mother's home in Missouri. On account of the continued recurrence of vomiting, especially in the morning, she believed herself pregnant. She was very hungry, especially on sitting down to the table, but was not able to eat as much as she helped herself to or ordered. The morning sickness continued for about three weeks, during which time she twice fainted, with complete loss of consciousness. She slept well, but frequently had palpitation of the heart. This was so violent on attempting to ride the bicycle that she had to give up such exercise. About September, 1898, a physician in Chillicothe, Missouri, saw her; he at first made a diagnosis of pregnancy and later of exophthalmic goitre. Under his care she improved somewhat, and the nausea disappeared towards the end of October. During November she was in Chicago, and was treated for a short time by Dr. McGhaughey, who, on account of the condition of her heart, placed her in the care of Dr. Robert Babcock.

It was through Dr. Babcock's advice that I saw her. I learned that the goitre began to grow in September and was at first most noticeable upon the right side. Both sides are now equally enlarged, the right a trifle longer than the left. Both the lateral glands and the isthmus are large, firm tumors. They do not fluctuate, but there is a pseudo-pulsation, seemingly due to the beating of the carotids. The whole gland is tender to the touch, the left side being the more sensitive.

The eyeballs began to protrude in September, since which time

there has been noticeable fluctuation in their prominence. The condition at present is one of marked exophthalmos.

The rapid pulse showed itself early before the true nature of the malady had been recognized. It has continued a prominent symptom ever since, and is now about 130. The desire to be uncovered and the feeling of suffocation and warmth have been noticed ever since the first sickness, in June, but it was a habit of hers before that time to wear light underclothing. The hands and feet have been moist and warm during the whole course of the illness. The hair, the eyebrows, and the nails are particularly fine, luxuriant, and glossy.

She sleeps well at night, but tosses about a great deal in her sleep. She is not disturbed by any ordinary noise on the street or in her room. She does not rise in the morning until between seven and eight o'clock. During sleep she does not snore, but breathes very deeply. She lies mostly on her right side, "curled up in a knot," as her nurse described it, with her feet sticking out from under the bedclothes. The vomiting and nausea have not been present since September, except in a very small way and at unexpected moments, and since October there has been no vomiting at all. She has no particular sensation except itching on the back, between the shoulder-blades, which is sometimes quite annoying.

Tremor and incoördination of the hands and fingers are quite marked, and her whole attitude is extremely nervous and characteristic. Her sensations are either normal or slightly hyperesthetic. Her hearing, sight, and sense of smell and taste are very acute. The skin over her elbows and knees is red and irritated by contact with the bedclothes. Her neck measures eighteen inches. The goitre lies under the borders of the sternocleidomastoid muscles. The pulse, temperature, and respirations, as exhibited in the daily record, average about 130, 99° F., and 28, respectively.

After consultation with Dr. Babcock and after again reading the literature of the surgical treatment of exophthalmic goitre, I undertook, on March 13, 1899, to remove the two lateral lobes of this goitre, despite the rather serious condition of the patient. An S-shaped incision was made along the border of the sternocleidomastoid muscle, the muscle pulled aside, and the capsule of the gland opened. The superior thyroid vessels were ligated, and afterwards the inferior thyroid and the gland raised with the greatest

care, and the attachment to the isthmus ligated off, in two masses, with strong silk ligatures. The gland was cut away with the scalpel. The opposite gland was removed in the same manner, leaving a little less than one-third of the substance of the thyroid in the isthmus and a limited blood supply.

Dr. D. H. Galloway, who administered the chloroform, made the following notes: "The patient's pulse was 160 when anæsthesia was begun. The radial pulse disappeared for several seconds once or twice a minute, though the heart continued to beat with perfect regularity. I began the administration of chloroform very cautiously, but in four or five minutes the patient was unconscious. The character of the pulse and respiration was not encouraging, and ether was tried for four or five minutes, but the heart pounded so much harder than chloroform was resumed. The pupils were contracted most of the time, dilating only once or twice when the patient attempted to vomit; this was prevented by pushing the anæsthetic. The pulse was not easily recognized at the wrist, and it was difficult to get the heart-beats, from the position of the anæsthetizer; so dependence was placed on the character of the respirations and the color of the ears, cheeks, and lips. At one time during the operation one doctor said that the pulse was 60 or 65, while another insisted that it was 200; both of them were probably wrong. The pulse seemed to me to vary between 140 and 180. Towards the close of the operation the face became bluish; this color deepened until the anæsthetic was discontinued, when the normal pink color slowly returned. The anæsthesia lasted three hours and two fluid-ounces of chloroform were used. The operation was finished at 1.30 P.M., and at 6 o'clock that evening the pulse-rate was 200."

The patient bore the anæsthetic and the operation well, but at the end was somewhat cyanosed. She recovered quickly, however, after the operation. The total time consumed in the operation, according to my notes, was two hours. After the patient was put in bed, she quickly regained consciousness and talked coherently, and after an hour or so had a few words with her husband. Her temperature was normal, having fallen almost a degree, but her pulse was extremely rapid,—between 160 and 200 to the minute. She urinated voluntarily twice; complained of thirst; took considerable quantities of water, but never vomited at all. I saw her several times during the afternoon and evening. She was bright, rational,

and cheerful. She complained of very little pain and no difficulty in breathing. She kept her feet uncovered, but was willing to be surrounded with hot-water bags. My last visit was at 10.30 o'clock. Her pulse was then 160, and her condition so good that I returned to my home satisfied, except in regard to her pulse. About 11.30, twelve hours after the operation, her nurse left the room for a glass of water, and on returning found her cyanotic, and she died within a few minutes.

#### SUPPRESSION OF URINE AND HEMORRHAGE AFTER OPERATION FOR GALL-STONES.

H. S. was sixty-three years old before he ever suffered any sickness which required the attendance of a physician. He led an outdoor, active life; he was in good circumstances, temperate, and moderate in all his habits. Shortly after his Thanksgiving dinner in 1898, he had an attack of pain at the pit of his stomach, with vomiting. This continued for most of the night, and was followed by fever, which was at one time pronounced to be typhoid and at another time pneumonia. After six weeks' confinement to bed, an abscess appeared directly over the region of the gall-bladder, which opened spontaneously and discharged a large quantity of pus. Since then this opening has nearly closed on three separate occasions; each time a violent attack of pain set in within forty-eight hours, followed immediately by jaundice and in three or four days by the appearance of a small abscess in the region of the scar, which opened again.

On examination I find a man with the general appearance of a well-preserved old age. He has no arcus senilis and no apparent thickening of his blood-vessels. His hair is moderately gray; his skin soft and slightly tinged from a recent attack of jaundice. He weighs one hundred and sixty-five pounds; is five feet and nine inches tall. He has a discharging fistula in the region of the gall-bladder, the discharges from which have no trace of bile. Palpation over this region elicits pain, but no tumor. No crepitation or friction sound is heard.

I made the diagnosis of stones in the cystic duct and probably in the atrophied gall-bladder, and recommended their removal, volunteering to do the operation under Schleich anaesthesia. This I attempted in November, 1899, at the Baptist Hospital. The fistula

was enlarged by an incision parallel with the ribs, and a half-dozen stones were removed from the cystic duct, without any great pain or difficulty. Two or three more stones could be felt deeper down, in what I thought at the time was the common duct. An anæsthetic was then given, and the atrophied gall-bladder and sinus were entirely removed by blunt dissection, and the stones found either in a dilated portion of the common duct or in a false cavity outside but in the neighborhood of the common duct. Their pocket was opened by careful incision with the scissors. No hemorrhage followed; even the smallest arteries were tied as fast as they were approached. Three more stones were removed, having all the appearance of stones from the lower end of the cystic duct. The stomach was inflated with a urethral-syringe point and a bicycle-pump, showing that the common duct was open. A drainage-tube was fastened into the bottom of the wound by means of a large catgut suture and the cavity around it packed with iodoform gauze. The abdominal wound was nearly closed.

The patient did well for the first three days, when there suddenly appeared considerable oozing in the dressings. This was increased apparently by repeated changing. The pulse rose in frequency, and when it had reached 130 I removed the stitches and repacked the wound with gauze which had been covered with powdered adrenal extract. The edges of the wound everywhere seemed to be slowly oozing, as if freshly made. During the time this hemorrhage occurred there was absolutely no secretion of urine. The bladder was catheterized, and a teaspoonful of thick liquid loaded with casts and epithelium was removed. At the end of forty-eight hours from the beginning of the hemorrhage he died, partly, I think, from the loss of blood, but really perhaps from the complete suppression of urine.

The second case which I wish to mention was that of my own father; he was seventy-four years old a year ago last January (1900), and up to that time had never had any sickness which confined him to his bed except once. Six years ago, while travelling in California, he was taken violently ill, at his hotel in San Francisco, at about eleven o'clock at night. He had a terrible pain in his back and abdomen, and vomited violently for more than eight hours. He despaired of his life, and gave some directions in regard to business affairs. He remained in bed only two days, and after this attack

complained of indigestion, eructation of food, and stomach trouble, but never felt that he was a sick man, and lived an active life. In the winter of 1899-1900 he had a slight stroke of apoplexy, which affected his left leg, but never produced unconsciousness or gave rise to any change in his habits of life. He has lived for the most part during the last six years on a farm, playing with stock-raising and dairy-farming.

On June 18, 1900, I received a letter asking me to come up and see him. I found him walking around his place, but slightly bent over, and on examination I found a tumor in the region of the gall-bladder, some little show of icterus, and a temperature a degree above normal. He told me that on the Sunday previous he had attended a wedding, and immediately after the wedding dinner, of which he ate only sparingly, he had an unendurable pain in his back and at the pit of his stomach, which was immediately relieved on leaving the table and vomiting. He says he could not have endured the pain another minute.

In the week following I received a telegram calling me at once to my father, and on arriving I found that twelve hours before he had been attacked with a similar pain, and that he was now very slightly jaundiced and almost unconscious. During these twelve hours he had passed no urine, had been delirious, and the bladder was found to contain only a thick, dark greenish fluid, not more than a drachm or two in amount. Following this attack the urine slowly reappeared, and at the end of three weeks the tumor in the region of the gall-bladder had entirely disappeared, the jaundice was not to be recognized, and the urine had reached somewhere near the normal amount for an active man of his age.

Four weeks after the second attack of biliary colic a third came on, and Dr. A. F. Lemke removed a small gall-stone from the cystic duct. Following this operation there was for six hours a continued oozing, which threatened his life, but by the use of adrenal extract thoroughly incorporated in iodoform gauze the hemorrhage was stopped. The amount of urea in the urine, which was less than four drachms on the day preceding the operation, gradually increased to fourteen drachms, and later to about normal. The wound quickly healed and he rapidly regained his usual strength.

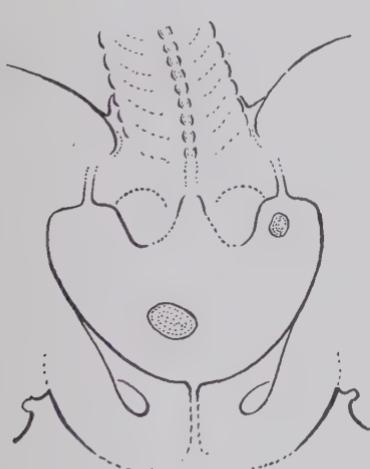
## A CASE OF CALCULUS IN THE APPENDIX MISTAKEN FOR CALCULUS IN THE URETER.

Mr. A., thirty-eight years of age, a locomotive engineer, had scarlet fever very severely when he was eight years old. At that time his legs swelled and we conclude he had post-scarlatinal nephritis. In his youth he had no serious illness. Several years ago he began to have pain in his right side; on one occasion it was so intense that he was obliged to leave his engine and be carried home. This pain was severe, paroxysmal, and in the right side and back; he does not remember whether it extended into his leg or not. His right testicle has been removed for unknown cause; it was painful and swollen. He has undergone an operation for right inguinal hernia; the scar is slight. The heart's apex is three or three and a half inches to the left of the median line, but there is no murmur. During the last four or five years he has suffered great distress in the penis when riding on the engine or even in the cars. The urine contains much pus and some blood, especially in the afternoon. The sound reveals a calculus in the bladder. On palpation over the abdomen an indistinct lump is discovered where the right ureter meets the bladder. This same small mass can be detected by rectal examination, but is not felt plainly enough to satisfy one that it is a foreign body. It feels like an enlarged lymph-gland. The right kidney can be palpated; it seems to be tender. The blood count at 5 P.M. showed thirteen thousand leucocytes to the cubic millimetre. On examination the urine is found to be yellow and cloudy in appearance, acid reaction, a specific gravity of 1020, with a trace of albumin, but no sugar; its sediment contains numerous pus-cells.

The patient was put on urotropine, five grains in a glass of water every two hours for forty-eight hours, to sterilize the genito-urinary tract preparatory to a lithotrity. In considering the source of the calculus in the bladder, the early nephritis, the absence of the right testicle, the scar of the right inguinal hernia, the tenderness of the right kidney, and the peculiar feeling of a nodule in the region of the right ureter, all received consideration. On account of the turbid urine, the stone in the bladder, and the unusual sensitiveness of the patient, cystoscopy and the division of the urine by the Harris instrument were omitted. The patient was, however, taken to the Fuchs laboratory and a number of skiagraphs were made. These

pictures showed no shadows in the regions of the kidneys. In one picture, an outline of which is shown (Fig. 5), there was a shadow showing the size and position of the bladder stone and another distinct shadow locating a mass where the nodule could be felt in the region of the right ureter. After considering the history with this new finding, it was believed to indicate a stone in the right ureter, probably at its very mouth. On this account, it was thought best to remove the bladder stone by suprapubic cystotomy, and then through the same opening extract the supposed calculus from the ureter.

FIG. 5.



Outline of skiagraph showing the stone in the bladder and the supposed ureteral calculus.

FIG. 6.



Showing the position of the stone in the vermiform appendix.

The patient was anaesthetized with chloroform. He did not take it well, and several times it became necessary to draw out his tongue. The operation was performed without delay or accident. The mucous membrane of the bladder was fastened all around to the fascia of the recti. The stone was extracted with smooth placenta forceps. The bladder was washed out and explored with the finger, but the small stone could not be detected until the other hand pressed it down from above, and then it felt as if an inch and a half or two inches away. It certainly was not near the bladder wall. On account of its inaccessibility through the bladder, an incision was made at the outer border of the right rectus and the stone picked up at once. Instead of being in the ureter, it was found in the appendix.

(Fig. 6), which was immediately removed and the abdominal wall closed. Drainage of the bladder was established, on account of its septic condition. The patient waked up and wished to see the stone while he was still on the table and before the dressings were put on.

Six hours after the operation he began to vomit large quantities of coagulated and dark blood, resembling coffee-grounds. This continued for three hours, with great prostration, rapid and almost imperceptible pulse, and even at one time collapse. Three pints of normal salt solution were infused subcutaneously during this period and the rectum was kept full of hot normal salt solution. For twenty-four hours all means of stimulating the heart and raising the blood-pressure were used, to no avail. He was pulseless at the wrist for more than eighteen hours before his death, which occurred twenty-four hours after operation.

A limited post-mortem was made. The abdomen contained no blood or urine or any evidence of infection. The bladder was very foul-smelling. The stomach was not examined.

**REMOVAL OF SUPERIOR MAXILLA; OPERATION FOR  
CLEFT PALATE AND HARELIP; TETANUS; TU-  
BERCULAR DISEASE OF RIGHT WRIST; OPERA-  
TION FOR LACERATION OF THE INTERNAL AND  
EXTERNAL SPHINCTER MUSCLES; RECTAL DIS-  
EASE; REMOVAL OF A DERMOID CYST; ROUND-  
CELLED SARCOMA; ANAL FISTULA.**

CLINICAL LECTURE DELIVERED AT THE MEDICO-CHIRURGICAL HOSPITAL  
OF PHILADELPHIA.

BY WILLIAM L. RODMAN, A.M., M.D.,

Professor of the Principles of Surgery and of Clinical Surgery.

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GENTLEMEN,—The first case that I bring before you is one for operation. The history is as follows: Mr. M., of Irish descent, aged seventy, has a malignant growth on the roof of the mouth, right side, of some months' duration. It is apparently confined to the hard palate, is distinctly cancerous or epitheliomatous in character, and appears to be a favorable case for excision of the superior maxillary bone. I have not been very optimistic about operations of this kind, inasmuch as patients usually seek relief too late. When, however, the growth can be entirely removed, the operation is justifiable, and promises prolongation of life, possibly a radical cure. Any other treatment than excision would be simply out of the question. All operations of this kind are necessarily bloody and indirectly followed by shock. The latter being usually due to the loss of blood, the question of controlling hemorrhage in these operations becomes the leading one. In order to overcome this danger surgeons have for many years been inclined to precede excision of the upper jaw by ligature of either the common or external carotid artery. The disadvantages of ligating the common carotid are that the cerebral circulation is greatly disturbed and the after-effects both unpleasant and dangerous. The operation is simple enough in itself. Ligation of the external carotid just above its origin, between the branches of the superior thyroid and lingual,

is sufficiently easy, but more likely to be followed by secondary hemorrhage on account of the numerous branches given off from the external carotid. In my judgment, it is better to place a temporary ligature around the common carotid, and to control the circulation by drawing upon it (but not tying it) should hemorrhage make it necessary. By simply making the ligature tense the circulation in the carotid can easily be controlled and the jaw removed with little loss of blood. I shall adopt this plan in the present case, believing it to be better than permanent ligature of either the common or external carotid.

The patient is now under the influence of chloroform, which is indicated in the present case for two reasons: first, because old people bear chloroform better than ether; secondly, in all operations about the head chloroform is the preferable anæsthetic, as it is not a stimulant to the heart, therefore causes less congestion of the tissues, and consequently entails the minimum loss of blood. Another very good reason for its employment here is that I may be compelled to resort to the use of the actual cautery to control hemorrhage. You will recall the fact that in my recent didactic lectures upon anæsthesia I distinctly stated that ether was contraindicated in operations about the face where the actual cautery was to be used. True, it may be employed if one is very discreet,—waits a few minutes and fans away the ether vapor. Still, I do not feel safe in using the actual cautery when ether is the anæsthetic.

I now proceed to expose the common carotid. It is done by an incision about three inches long, parallel with the anterior border of the sternomastoid muscle. I cut through the skin, superficial fascia, and platysma, at once coming down upon the sternomastoid, which is pulled externally. Pulsation may now be felt in the carotid and its sheath is exposed. Making a small opening in the latter, so as to interfere as little as possible with the nutrition of its coats, the aneurism needle is passed from within outward in such a way as to avoid the internal jugular vein, which is situated externally, and the pneumogastric nerve, which is situated posteriorly. I now have in position a ligature of chromicized catgut, but will not tie it; the ends being left long so that they can be pulled upon and the circulation in the artery perfectly controlled, as I now demonstrate. Many surgeons would also do a preliminary

tracheotomy on account of the danger of blood passing into the air-passages and causing asphyxia primarily and pneumonia secondarily; but, in my opinion, this increases rather than lessens the dangers of the operation, and consequently I have never resorted to it.

The head of the table is now lowered so as to bring the patient into the Trendelenburg position, which has been found greatly to facilitate the escape of blood from the mouth. Though plugging the nostrils is advised by many writers on operative surgery, it will not be done in this case, as I believe little is accomplished by it. The incision is made parallel with the floor of the orbit, extending well out from the malar bone to the inner canthus, thence downward along the side of the nose around the ala to the median line, thence downward through the lip. The large flap thus formed is rapidly dissected upward, hemorrhage being, for the time, controlled by pressure. I know of no operation in which a good assistant is more necessary than in the one now being performed. The flap having been turned up, the bleeding vessels may be seized and ligated, or hemorrhage may be controlled by forcipressure. You see that the bleeding is well in hand. It now becomes necessary to sever the bony attachments. This is done by first cutting rapidly with a large curved bone-forceps through the nasal process of the superior maxillary bone. As in this case the lower floor of the orbit is not involved, the pliers will not extend into the orbit, but I will cut just below the orbital plate out as far as the malar bone. This is easily accomplished. I now cut the malar process of the superior maxillary bone upward as far as the spheno-maxillary fissure. With my bistoury I make an incision on the floor of the nasal fossa all the way back. I rapidly cut just to one side of the median line through the soft tissues of the hard palate, then transversely at the junction of the hard and soft palates. Rapidity of work is here absolutely necessary, as one cannot stop to control hemorrhage: it must go on until the bone is removed. With a fine keyhole saw introduced into the nasal fossa I quickly saw through the hard palate. This, of course, includes not only the palate process of the superior maxillary bone, but the horizontal plate of the palate as well. Having sawn through, I now with a large lion-jawed forceps loosen the remaining attachments by a rocking or to-and-fro motion, and in this way lift out the entire superior maxillary bone.

The hemorrhage has not been great,—less than I feared,—and it is unnecessary for me to even make tense the temporary ligature upon the carotid. As you see, Dr. Laws follows my movements and quickly makes gauze pressure so as to control bleeding. I will now remove the temporary packing of gauze and substitute for it iodoform gauze, which is left in the wound for at least twenty-four, better, possibly, thirty-six hours. Iodoform gauze is undoubtedly preferable, inasmuch as the mouth is always a septic cavity, and two of the chief dangers after this operation are infectious pneumonia and pyæmia. While this is true, one should always remember that elderly persons are exceedingly liable to iodoform-poisoning when a large vascular and absorbing surface is covered with iodoform. The packing being in position, I am now ready to close the large wound by sutures. This is best done by interrupted sutures of fine silk. The incision through the lip and around the nose is covered with iodoform collodion so as to protect the wound from the secretions and possible infection. While all arrangements have been made to combat shock, and the assistant is ready to use hypodermoclysis, it is unnecessary, as the old gentleman has at the end of the operation a full, strong pulse of 80. The temporary ligature beneath the carotid is now removed and the wound closed with interrupted sutures. The incision made in this case is that usually called Fergusson's incision. There are various other methods of removing the upper jaw; the intrabuccal, for instance, which is more difficult, and has nothing to recommend it save the fact that it entails less scarring of the patient. By leaving the orbital plate of the superior maxillary as has been done in this case, dropping of the eye with consequent unsightliness is avoided. I am gratified to find that the entire growth has been removed and that my original judgment has been vindicated (Fig. 1).

You will perhaps ask, What are the chances for a permanent cure? While far from as pessimistic as Butlin, who believes that this operation has done little good and should possibly be eliminated from surgery, I am distinctly of the opinion that few cases are permanently cured by excision of the upper jaw. I should call this one of the most favorable cases I have seen, and the limited growth and the age of the patient lead me to hope that his life may be greatly prolonged and comforted, if, indeed, he has not been permanently cured. In the very old malignant disease gives a better

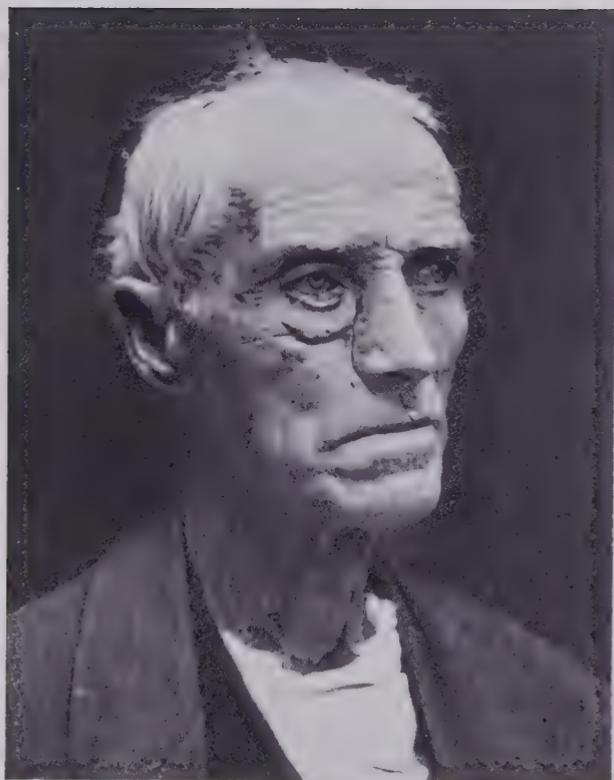


FIG. 1.—Patient after removal of the superior maxillary bone for cancer.



prognosis than a similar condition in the young, and I have learned to look upon the age of the patient as one of the best prognostic signs. In the very young cancer is rarely cured by the most extensive operation. The after-treatment of this case will consist of nutritive enemata for forty-eight hours, as it will be almost impossible to feed him through the mouth on account of the enormous gauze packing. The gauze will be removed in twenty-four or thirty-six hours, and the mouth rinsed with a carbolic acid solution (1 to 100) every few hours.

CASE II.—The next case is that of an infant, seven months of age, with congenital deformities known as cleft palate and harelip. On account of these the child is unable to nurse and has been artificially fed since birth. While this little patient has both congenital harelip and cleft palate, you are not to infer that the two conditions necessarily go together. They frequently coexist, yet it is quite common to have a harelip without a cleft palate, and a cleft palate without a harelip. When you see these distressing cases, as you not infrequently will in practice, the first question that will be asked by anxious parents and relatives is, What is to be done? The question as to the time of operation is of great importance, and one upon which surgeons widely differ. If the child be unable to nurse, it becomes necessary to perform the operation as early as practicable; not, however, until a few days or even a few weeks after birth, even upon a harelip. Much blood may be lost, and these little patients stand the loss of blood badly. The majority of surgeons believe that if the child can be well nourished in other ways, it is best to postpone operation until some favorable time between the third and sixth month. It should, however, be done before teething begins. As to the cleft palate, nothing should be done until the child is several years old. Correcting the harelip benefits the cleft palate to a degree, but of course does not obviate the necessity for a later operation. As to the best procedure for harelip, I must say again that surgeons differ widely. Doubtless all of the many operations in established use are indicated for individual cases, and he who limits himself to no set operation, but does the one which, in his judgment, seems best suited to the case in hand, is the more judicious surgeon. In all of the operations a free dissection of the lip is necessary. All attachments and adhesions must be freed, the edges freshened, and accurate approximation

made. The best known operations are those of Nélaton, Malgaigne, Rose, and Mirault. I have usually preferred Malgaigne's operation, which consists in freshening the edges upon either side and turning down two flaps. While it has served me well, and I believe it to be an excellent operation, it does not seem to be as well calculated to close in the large gap and unsightly deformity in the case before us as that of Mirault (Fig. 2). This operation

FIG. 2.



The upper illustration shows the lines used in freshening the edges of the harelip: A, the edges freshened; B, the wound is shown here both sutured and transfixed with a pin.

consists practically in a single flap taken from the side where the tissue is most redundant. I freshen the edge at the inner side of the gap where the lip is short, and raw the surface well down through the vermillion border of the lip. I now cut from the outer side a rather large flap, beginning high up within the nose, and carry it down to very near the vermillion border. This flap is turned downward, brought in contact with the opposite rawed surface, and I am then ready to suture. Suturing can be done with silk, silkworm-gut, chromicized catgut, or even by means of the old harelip pin. While I have many times employed harelip pins,

and have found them satisfactory in the main, they cause scarring unless removed at the end of forty-eight hours. I shall therefore use in this case silver wire, which does as well and can be left longer. Whatever suture is employed, it should pass down to, but not through, the mucous membrane of the mouth. The number of sutures will vary with the case.

The little patient being now under the anæsthetic (and you see again that I am giving chloroform, for it is decidedly the better agent in children), a provisional suture is first introduced on either side of the cleft, so as to control the circulation in the coronary vessels. This is a new and valuable suggestion, and enables one easily to control hemorrhage. It should be inserted just above the vermillion border of the lip, and the ends of the suture should be sufficiently long for the assistant to handle them without getting in the operator's way. Dr. Burns has the ligatures in his hands, and I can make a free dissection of the lip with an insignificant loss of blood. What little there is will escape through the mouth, as the child is in a moderate Trendelenburg position. I am making a very free dissection of the lip and ala of the nose, so as to free them from the bony attachment. As a rule, I do not think it best to break the intermaxillary bone with a strong sequestrum forceps and force it back into position. It is occasionally done, but the trend at the present time is not to do so, but simply to repair the cleft in the soft parts, and to trust to the continued pressure of the lip and to the future growth of the jaw to overcome this deformity. I am very much gratified to find that the single flap corrects the deformity beautifully; indeed, I do not see how it could be better. I introduce three sutures of fine silver wire through all of the tissues of the lip except the mucous membrane. These control the hemorrhage as well as harelip pins. Between the silver sutures others of fine chromated gut are inserted. These extend well up into the nose and through the under surface of the lip. It is to be expected that this child will cry from pain and hunger, therefore it becomes necessary to use some form of appliance which will make gaping less likely to occur, and which will avoid undue tension upon the sutures. While various forms of apparatus (so-called trusses) are made use of, there is, in my judgment, nothing either so comfortable or so good as an iodoform collodion dressing. Moreover, it is antiseptic and prevents scarring

and infection. The dressing being applied, the operation is complete. I have never seen so little hemorrhage after an extensive hareclip operation, and am much pleased with this method of controlling the coronary vessels. It is usually recommended that hemorrhage be controlled by serrefines or by the fingers of an assistant. The former nearly always slip, the latter are in the operator's way; neither are so efficient as the ligature used in the present case.

The after-treatment is simple. The child will be given minute doses of opium and chloral to keep it quiet, and will be fed on milk by means of a spoon introduced well into the back part of the mouth. In this way strangling and regurgitation through the nostrils will be prevented. It will be unnecessary to remove the sutures for four or five days; some of them are absorbable, the others non-irritating. I shall bring the little patient before you at the next clinic, and you will see the result.

CASE III.—The next case is one of those rare, distressing, usually fatal ones known as tetanus, or by the laity as "lock-jaw." A young man, twenty-two years of age, six days ago stepped upon a rusty nail which punctured the sole of his foot. He came to our out-door service, and the wound was enlarged, curetted, and cauterized at the time, so I am told by Dr. Leith, the accident surgeon who had charge of him. He entered the hospital last evening with some stiffness of the lower jaw and pain in the back. His temperature was normal and his pulse 72. There had been pain in the wound, but this had entirely subsided. There is, as you will see when the wound is undressed, no redness, no oedema, and nothing locally that would indicate the serious condition the man is in. He will now be brought before you, and I shall be careful not to use the words lock-jaw or tetanus in the man's presence, as his mind is quite clear, and his condition will not impress you as being one of as great peril as it is. The temperature is still normal, pulse 76. His countenance is placid; his pupils are normal. When I ask the patient to open his mouth, you will see that he is unable to do so, except to a very limited extent. I feel the masseter muscles, and they are contracted. He is able to swallow. There is no sore throat or other evidences of inflammatory disorder. He still complains of backache, and shows a marked tendency to diaphoresis. This latter is a very suspicious symptom, and, accompanied by the trismus and backache, indicates pretty clearly the nature of the

disease. The patient is able to move his head forward, backward, and laterally, showing that spasm of the muscles is as yet limited to the masseters. You will note particularly the placid expression of the patient, and I shall have something to say upon this later.

The patient being removed, now that you have seen him, to the anæsthesia room, we can discuss more freely the diagnosis and proposed treatment. The case is one of tetanus, for all inflammatory disorders that might confound us can safely be eliminated. I have observed inflammation of the throat or temporo-maxillary articulation produce a seeming trismus resembling that of the present case. I remember particularly to have seen a colored woman who showed just such a condition the day after I had done a hysterectomy. The trouble was inflammatory, as an examination proved, due to exposure during the operation, and quickly passed away; not, however, until it had caused me some uneasiness, inasmuch as tetanus is very common in the negro. Hysteria may also simulate this condition, and in neurotic women one should always have this disease in mind. In the later stages of tetanus one may easily mistake strychnine-poisoning for this disease. Here, however, the convulsions are not tonic but clonic, and extend to the muscles of the hands and forearms, which is not the case in tetanus. Moreover, objects appear green to the patient, and the duration of the case will usually prevent any serious mistake, inasmuch as the patient either recovers or dies in a short time.

Now, as to the cause of tetanus. In the first place, it is an infectious disease due to a specific bacillus, anaërobic in character, which is found in superficial soil. It is pre-eminently a disease of the tropics, more particularly attacks the dark-skinned races, and is most liable to the African. In some southern islands, as Jamaica, for instance, one-fourth of the new-born infants die of this disease. It is very common all over our Southern States. It may, however, occur in any race or in any clime, having been known even among the Esquimaux. It is particularly apt to occur in armies, and soldiers on the march, depressed by fatigue and defeat and at the same time illy nourished, are very liable to it. It frequently occurs in connection with punctured wounds, on account of the fact that the germ is an anaërobic bacillus, and does not live in pure oxygen; contact with the air destroys it; therefore it is easy to understand how small, punctured, illy drained wounds are most likely to be

followed by this direful disease. The period of incubation varies. It may be twenty-four, forty-eight, or seventy-two hours, as in the most acute cases, or delayed a fortnight or even longer. Upon this depends the fatality of the disease. If it develops within the first week after injury, it is denominated acute tetanus, and the end is almost invariably fatal. If it develops as late as the fourteenth day or afterwards, the prognosis is reasonably good; in fact, a majority of such cases recover. This should be remembered, as the result of treatment may, without this knowledge, be misinterpreted. It is my belief that nothing does good in acute tetanus. Later in this case the symptoms will, of course, become more marked, and the characteristic drawing back of the head from contraction of the muscles of the neck and back will produce the peculiar symptoms of opisthotonus. At times this is so extreme that the patient rests upon his head and heels, the body being arched forward. Sometimes the contractions extend to the muscles of the abdomen. They are hard, rigid, and board-like. The head is drawn forward, making a condition known as emprosthotonus. More rarely the muscles of the side may be so contracted that the patient is arched laterally, which is known as pleurosthotonus. In addition to these tonic spasms there are clonic spasms in many instances involving more or less all of the muscles of the body. These clonic exacerbations may come on without warning and without apparent cause, but in most instances they are due to any excitement, noise, drafts, attempts to drink, or, indeed, anything which disturbs the patient. Moreover, the spasms may extend to the sphincters, and on this account the patient is unable to empty the bladder voluntarily. This condition, of course, calls for the use of the catheter to prevent rupture of the bladder.

Now as to the treatment. As I have told you, I have little faith in the treatment of tetanus; and yet there are certain things that one must do to comfort the patient, to keep the spasms in abeyance, and to prolong life; for it has been clearly shown that patients with acute tetanus who live beyond the fifth day are more likely to recover. Many of you will remember the statistics I quoted last year when lecturing upon tetanus didactically. The Surgeon-General's report of the War of the Rebellion showed that of three hundred and thirty-seven cases of tetanus two hundred and eighty-seven died during the first week. The fatal days are the

third, fourth, and fifth. There is a marked falling off in the death-rate after the fifth day, and in the larger statistics reported by the late Professor Yandell, of Louisville, it was shown very clearly that if patients could be tided over the fifth day there were good prospects of recovery. Now, how is this to be done? Only by the best of nursing and the most judicious of feeding. The patient being often unable to swallow, the stomach-pump must be introduced from time to time, even though it be necessary to use chloroform, and concentrated liquid food introduced. Morphine and chloral control the spasms to some degree, and these can be supplemented when necessary with chloroform carefully administered. But you ask, Are there no specifics? No. Calabar bean and many other agents have been thought of value, and practically the entire medical armamentarium has been exhausted. What is to be done with the wound? It should always be enlarged, drained, and curetted, and good may result from this treatment. I shall do more here, and freely excise the infected tissue, though I have little faith in its efficacy. In truth, experiments on lower animals have shown that amputation of the infected limb does no good whatever when tetanus has developed. The tetanus toxin, when introduced into the tails of sheep, will cause tetanus unless the tail is amputated at once. With the onset of the first symptoms of tetanus amputation is useless. Yet I am glad to be able to say that much can be done in the way of prophylactic treatment. By using the tetanus antitoxin hypodermically, immunization to the disease may be established. A majority of surgeons and practitioners believe that certain results will only follow the antitoxin used for prophylactic purposes. Some there are who maintain that serum introduced hypodermically—much better, possibly, in the subdural space—has an ameliorating, if not a positively curative effect. Roux and others have trephined and introduced the serum beneath the dura and seemingly saved cases by it; but a careful analysis of such reported cases will, in my judgment, usually, if not invariably, show that they were cases of chronic rather than acute tetanus, and the presumption is a fair one that the recovery was due not to the serum, but to other causes. From the time of Hippocrates it has been recognized that cases of chronic tetanus frequently recover without treatment. Still, while not expecting much from the treatment either locally or generally, we are in acute tetanus confronted

with a direful and pitiless disease which is certain to result in death if left to itself, and we are justified in using heroic methods. I will, therefore, not only give the patient the benefit of the local treatment spoken of,—namely, free excision of the infected area,—but will also trephine the skull and introduce the antitetanic serum in the subdural space. Roux, of France, introduces it into the cerebral substance itself, believing that the poison of tetanus is "fixed," as it were, in the cerebral cells, and can best be reached by injecting the serum directly into the brain. The patient being now again before you, I will proceed to trephine at a point about three inches above and in front of the ear. The skull is exposed by a semilunar incision and the trephine applied. As soon as I reach the diploe, I find rather freer hemorrhage than is customary. This sometimes occurs from a larger vessel than usual in the diploe. The hemorrhage is less free, and can be stopped only by rapidly removing the button and then making pressure. The button being removed and examined, the cause of the hemorrhage will be seen, as there is a channel passing through the button large enough for a probe or a wooden toothpick to pass through without difficulty. Such hemorrhage can be controlled either by plugging the openings or by pressure; the latter method is the quicker and preferable one. I now introduce twenty cubic centimetres of the serum beneath the dura. To prevent further bleeding a packing of iodoform gauze is left in the opening, and the wound in the scalp is closed by interrupted sutures. I now excise the infected wound of the foot. Although the hemorrhage was quite free for a time, the patient is in good condition, with a pulse of 80. This indicates that no great amount of blood has been lost, and that the loss has been well borne.

The after-treatment will consist of forced feeding at regular intervals with the intranasal tube. The patient will be kept in a quiet room, and everything done to keep his spasms in abeyance. The quick onset of the disease after the injury indicates, as I have told you, a fatal result. I shall hope for the best, but expect little.

CASE IV.—The next case is that of a young woman, twenty-two years of age, with tubercular disease of the right wrist. You will see that the back of the hand is swollen and that it is very tender, so much so that the patient instinctively keeps it still so as to avoid motion of the joint. A skiagraph has been made of the



FIG. 3.—Skiagraph of normal wrist.



FIG. 4.—Skiagraph of the tuberculous wrist in Case IV.

wrist-joint and carpus; this indicates that the bones are softened and in a condition of chronic inflammation. I show you for comparison a skiagraph of the normal wrist (Figs. 3 and 4). In subjects of this age such a condition usually indicates tuberculosis. You may ask how the tubercle bacillus reaches the wrist-joint without a wound. The germ is carried in the blood, and simply fastens itself upon a locus minoris resistentiæ. The same thing takes place in tubercular disease of the hip, or in lymphatic glands. Sometimes, it is true, the process does not remain a strictly tubercular one, but the joint becomes the seat of mixed infection. I hope that that has not taken place here, inasmuch as it is always an undesirable complication and would make futile the treatment I purpose employing to-day. How are such conditions treated? On account of the fact that excision of the wrist-joint—typical or atypical—does not give a good functional result, I am disposed in this case to treat the disease by injection of iodoform. I will tap the joint with a trocar and cannula, drain it, wash it out with sterile water, and then inject a ten per cent. solution of iodoform in glycerin. The emulsion of glycerin should be recently boiled, as should, of course, the instruments used. All aseptic precautions are taken, as it is very desirable to avoid mixed infection. This treatment, which is extensively practised at the present time, has much to recommend it, and in suitable cases will oftentimes be followed by a permanent cure. The injections are repeated at weekly intervals, twice or thrice, possibly more frequently, until the symptoms are relieved. Meanwhile the joint should be kept at rest, the limb either being encased in plaster or fixed upon suitable splints. At the same time cod-liver oil should be given internally. The puncture is made, the joint irrigated with sterile water, and I now throw in the sterile emulsion of iodoform. The puncture is also sealed at once with iodoform collodion. The joint is now fixed upon splints, and the treatment will be repeated a week hence. I wish to impress upon you the fact that this method should always be given the benefit of a fair trial before surgical measures are instituted. I have seen many excellent results follow the treatment and I have rarely observed a good functional result from excision or erosion of the wrist-joint. This girl must win her bread with her right hand, and I would not be doing my duty by her unless I gave the present treatment a fair trial. I shall bring

her before you a week from to-day, and I hope to see a very decided betterment in her condition.

CASE V.—The next case is one of extreme interest. A young man, a farmer, twenty-nine years of age, jumped from his wagon and the handle of a pitchfork entered his rectum far enough to cut the external sphincter muscle completely across, the internal sphincter partially so. The accident occurred four weeks ago. There is still a sulcus large enough to allow my finger to rest in it. The patient, of course, is unable to control the escape of gas and fecal matter. The incontinence is almost complete. Without the intervention of surgery, the chances are that nature will do little, and he will be condemned to a life that is unsatisfactory to himself and disgusting to his friends. He also has a right inguinal hernia, not complete, but what is technically called a bubonocelle,—a hernia descending into the inguinal canal. I will, therefore, attempt to relieve both conditions to-day.

The patient suffers a great deal from bronchitis, and has a slight attack now. Ether being contraindicated, I must select another anaesthetic. What shall it be? His heart is not good; it is weak, and he probably suffers from myocardial disease. On this account chloroform is unsafe; therefore, the safest anaesthetic to be employed is spinal anaesthesia produced by cocaine. Not only are ether and chloroform contraindicated, but there is a positive indication for spinal anaesthesia, inasmuch as it is very desirable to have the intelligent co-operation of the patient, particularly during the repair of the severed sphincter muscles. By bearing down and forcing the rectum low, he can greatly aid me in my manipulations. So you see that I am using spinal anaesthesia as a *dernier ressort*; not that I prefer it, but because I must, and believe it, under the circumstances, to be safer and better than either ether or chloroform. While I have used this treatment a number of times in the past year, it has always been in cases in which the customary general anaesthetics were contraindicated. I would have you distinctly understand this; and yet, while making this statement, I am free to say that I have seen nothing but the best results follow spinal anaesthesia. In none of my cases have there been unpleasant, much less alarming, symptoms.

The back has been thoroughly scrubbed with soap and brush and washed with bichloride of mercury, ether, and alcohol. The

needle which I use has been boiled, and is again passed through an alcohol flame just before its introduction. The point selected is the fourth lumbar interspace. It is located by a line drawn from the highest points of the crests of the ilia, and this line should pass through the spinous process of the fourth lumbar vertebra. The needle is introduced one-third of an inch to the right of the median line, and its point then directed towards the centre. It traverses skin, fascia, lumborum muscles, and meninges, and should be at least three inches long, better four. As soon as I reach the subarachnoid space you see a few drops of the cerebrospinal fluid escape. I am now certain that the needle is where I want it, and I will therefore introduce fifteen minims of a two per cent. solution of cocaine which has been thoroughly sterilized by the fractional method. It should be slowly inserted, at least a minute being occupied in doing so, and the needle left *in situ* two minutes longer. This is done to prevent leaking of the fluid through the opening in the membranes. Having waited the necessary time, I withdraw the needle and cover the puncture with sterile iodoform collodion. A pad of gauze over the puncture completes the technic. I will now wait at least ten minutes, at the end of which time the patient will probably complain of tingling in his feet, possibly nausea, perhaps vomiting. These symptoms indicate that the constitutional effect of the cocaine is felt and that analgesia is at hand. The pulse may be accelerated, though in my experience this is exceptional. It is always best to blindfold the patient and put cotton in his ears so as to avoid psychic pain, as a nervous person who sees the cutting going on is apt to imagine that it is painful. I cannot lay too much stress upon this. We have in this patient a good subject, as he is neither nervous nor of a neurotic temperament. Still, it is not pleasant for one to know that he is being cut, and I take the same precautions with him as I would with a more nervous person.

It is now nine minutes since the cocaine was introduced. I ask him how he feels, and he answers that there is tingling in one leg. There is no nausea, no sweating, or other indication of the constitutional effect of cocaine. His pulse is 70. While it is a little early to begin, I will see if analgesia has been produced, and at once make the ordinary incision for a Bassini operation. It extends practically from the anterior superior spine of the ilium to the pubes, being one-half inch above and parallel with Poupart's

ligament. The action of the cocaine is perfect, and he replies to my inquiry whether he has pain that he feels nothing at all. The aponeurosis of the external oblique is now split on a grooved director up to and beyond the internal ring and is dissected upward as far as the rectus muscles, below to the shelving of Poupart's ligament. I now isolate the sac and cord *en masse*. Having done this, it becomes necessary to separate the sac from the cord. In herniae of this variety the sac is usually anterior to the cord; I find it here somewhat laterally or antero-laterally to the cord. It is small and is easily separated up to the internal ring. I now open it, as should always be done before ligating, so as to be sure that it is empty. The appendix, a knuckle of intestine, or a small piece of omentum may be included in the ligature if this precaution is not taken. Assuring myself that the sac is empty, I have Dr. Burns pull down upon it and twist it. This causes it to descend still farther, and renders a return of the hernia less likely. I ligate the neck of the sac with chromicized gut. It now becomes necessary to transplant the cord, and this is done by making a new canal for it. I sew the conjoined tendon to Poupart's ligament by interrupted sutures of chromicized gut. As the weak point in this case seems to be at the internal ring, I shall place two sutures above the cord instead of one, as is usual. In placing the first suture one should feel carefully for the epigastric artery, so as to avoid puncturing it or the accompanying vein. Five or six interrupted sutures are necessary. Having tied the sutures, the floor of the new canal is now constructed, and you see that the parts are nicely in apposition. It will not do to use ordinary gut, as it undergoes resorption too quickly. I am uniting structures of comparatively low vitality, and must use suture material which is sufficiently abiding. In chromicized gut we have the ideal suture material. This will remain in the tissues from a fortnight to three weeks, and by the end of this time good union should have occurred. I now close the external oblique muscle with a continuous suture of chromicized gut. This completed, I close the skin incision with a subcuticular suture of silver wire, which brings the skin nicely together, leaves a linear cicatrix, and insures primary union. The wound is covered with sterilized silver foil, and over this a pad of sterile gauze is placed, which is kept in position by strips of adhesive plaster or, better, a spica bandage. The latter controls hemor-

rhage and prevents oozing into any dead space that may have been left.

The herniotomy being completed, I am ready to operate upon the rectum. Thirty-five minutes have elapsed since the introduction of the cocaine; twenty-five since I began to operate. The effect of the cocaine usually lasts from an hour to an hour and a half, varying with each case. You will doubtless notice that this patient has suffered absolutely no pain during the herniotomy. I have repeatedly asked him if he did, and he has assured me that he did not. Of course, it would have been manifestly improper for me to perform the rectal operation first, inasmuch as that region is always septic. I now bring him down to the edge of the table, put him in the lithotomy position, irrigate the lower rectum, which has been emptied by an enema, and ask the patient to bear down so as to bring the internal sphincter into view. With his aid and the judicious use of retractors you can see the very large wound which extends from the buttock up to, and partially through, the internal sphincter. I would remind you, by the way, that the internal sphincter is of more importance than authorities have usually considered it. Without its use, *involuntary* closure of the lower rectum is impossible. The internal sphincter is a band of circular, involuntary muscular fibres placed about an inch and a half from the verge of the anus. The external sphincter is a true sphincter muscle which arises from the coccyx and passes forward upon either side to be inserted into the central tendon of the perineum. This controls *voluntary* closure of the rectum, is most important, and if cut through in more than one place is very apt to be followed by incontinence of faeces. This is an important point, and should always be remembered in operating for anal fistula. It is remarkable that this wound made by the handle of a pitchfork is identically like that made by the surgeon in operating for anal fistula, only it is deeper and somewhat more ragged. I first curette away all unhealthy granulations and inflammatory tissue. I now dissect up the mucous membrane on either side of the wound until the internal sphincter is well exposed. Having done this, and recognizing the fibres of the muscle, I call upon my friend Dr. Laws to inspect the wound and to say whether or not I am correct. He does so. Those of you on the front row can see the muscular fibres. I shall now, with a curved needle threaded with chromicized gut, attempt to

bring the severed ends of the internal sphincter together. I again ask the patient to bear down so as to assist me. He does so very well, and you see now the advantage in doing this operation under spinal analgesia. It would be impossible to operate so well under general anaesthesia. I have passed two deep sutures through the internal sphincter, and am ready to tie and bury them. I suture the two ends of the severed external sphincter in the same way and place three buried sutures of chromicized gut; all are tied. I now bring down the mucous membrane and suture it carefully. This stage of the operation somewhat resembles Whitehead's method of operating for hemorrhoids. This being done, the finger in the rectum indicates that the lumen of the gut has been greatly narrowed, and I am led to believe that a good functional result will be secured. An hour and a half have elapsed since the introduction of the cocaine, and the operation has been absolutely painless, except the last two stitches which passed through the skin. So you see that what I told you as to the duration of the analgesia has proved to be correct.

The after-treatment will consist of small doses of opium to prevent action of the bowels for three or four days. The patient will be fed upon beef tea. No milk or solid food will be allowed, as both cause much fecal matter. A small plug of iodoform gauze is left in the rectum. In none of the cases subjected to spinal anaesthesia has the result been better than in the present one. The pulse has not gone beyond 84, and there has been no nausea, no vomiting, no sweating, or other disagreeable symptom. I am sure that I could not have done so well with a general anaesthetic. It is unfortunate, of course, that the patient was not brought to us sooner; but, notwithstanding the delay, I am led to hope for, nay, expect, a good functional result from operative interference four weeks after the injury. You will recall the statement made in my didactic lectures that the rectum is one of the most sensitive regions of the body, and for this reason the third degree of anaesthesia must be entered upon. This is always a dangerous stage, and explains the frequent deaths following general anaesthesia for trivial operations, such as hemorrhoids, fistula, and other rectal operations. The rectum is abundantly supplied with nerves from both the general and sympathetic systems, and the reflexes are greatly excited by any operation upon this region. Rectal operations are well done

under spinal anaesthesia, and it may be resorted to in any case in which there are contraindications to either of the general anaesthetics in well-established practice.

[NOTE.—Four weeks subsequent to operation patient has perfect control over both faeces and gas.]

CASE VI.—The next case is also one of rectal disease, but entirely different from that just presented. The patient, a woman thirty-five years of age, suffers greatly after defecation. The pain is exruciating and lasts for half an hour. There is little or no blood. I at once suspect that she has a fissure. Ether being administered and an examination made, the diagnosis is confirmed. The so-called fissure of the rectum is nothing more nor less than a crack or irritable ulcer. In this case it surmounts an old pile or tag; what has been well called the sentinel pile. There is an hypertrophied piece of skin or tag which has followed an old external pile. On its summit, about the centre, there is a small ulcerated surface. It is a typical case of fissure situated posteriorly. The treatment is simple, and I shall follow the plan usually practised at this clinic of divulsing the sphincter muscle. You may ask why the ulcer does not heal. It is due to the rigid contraction of the sphincter ani muscle. The latter is in a condition of tonic spasm which makes healing impossible. Local applications may cure mild cases in exceptional instances; it is, however, too uncertain a treatment to depend upon, and it will be necessary to at once submit such patients to operation. Introducing my fingers into the rectum, I stretch them widely until I produce relaxation of the sphincter ani muscle. It should be so well stretched that laterally the fingers touch the tuber ischii upon each side. The result of this stretching is a paralysis, for the time being, of the muscle which places it at rest; prevents its contraction, and allows the ulcer to heal. This operation was introduced more than a half-century ago by Recamier, of France, though it is oftentimes improperly spoken of as the operation of Van Buren, who simply reintroduced it many years after Recamier. This is the favorite American method of treating fissure ani, and, in my judgment, it almost invariably succeeds. Furthermore, one need not be anxious about permanent incontinence as the result of over-stretching; I have not known it to occur in any case thus treated. The English frequently treat fissure by cutting into the ulcer through the fibres of the sphincter

ani muscle. This, of course, insures the same thing,—rest to the muscle and cessation of its irritable contractions. While I do not doubt its efficacy, I have rarely practised it, and believe it to be no better than forcible divulsion.

The after-treatment will be much the same as in the previous case, the bowels being confined and the patient fed upon liquid diet so as to insure rest of the parts. Within a fortnight I shall expect the patient to leave the hospital *cured*. The ulcer will heal rapidly, and the slight hemorrhage and exudate which always follow this operation will have been absorbed.

Until you have treated such cases you will not believe how great is the pain and the general reflex disturbances following so slight a trouble, as the patient's general health is oftentimes undermined from dyspepsia, insomnia, vesical disturbances, and so forth. Again I tell you that all such symptoms are due to the fact that this region is so abundantly supplied with nerves from the general and sympathetic systems and that near organs may suffer sympathetically. I know of no little operation in surgery that is followed by a more uniformly happy result.

CASE VII.—The next case is that of an infant less than three months old, with a congenital tumor above the right eye (Fig. 5). Tumors in this situation are more likely to be congenital than otherwise, and are very generally cystic in character. This case is no exception to the rule. It is a fluctuating and seemingly tightly distended cyst. What are the probabilities as to its nature? Dermoid cysts are particularly common in this region, and one should always have them in mind. It may, however, be a simple sebaceous cyst. Chloroform having been administered, I make a linear incision over the tumor, and am very careful to grasp every bleeding point, so that the little patient will sustain as slight a loss of blood as possible, knowing that children of such tender age bear shock and hemorrhage badly. I now come to a tightly distended cyst. It is bluish in color and about the size of a hazel-nut. I shall attempt to remove the cyst entire without rupture, and I succeed in so doing. It was attached to the periosteum covering the frontal bone. Cutting into the cyst, I find a watery fluid, a little cheesy material, and a few very fine hairs. I have rarely, if ever, seen such clear fluid in a sebaceous cyst, and the solid contents—especially hairs—cause me to think it a dermoid. It was, moreover,



FIG. 5.—Dermoid above the right eye.



FIG. 7.—Further growth of sarcoma of the face, showing marked degenerative changes.



FIG. 6.—Round-celled sarcoma of the face.

very deeply placed, and this certainly tends to confirm my opinion as to its character. Dermoid cysts in this situation, as elsewhere in the body, are very greatly stimulated at puberty and take on a rapid growth. This is due to the fact that the skin is unusually active at this time of life, when the hairs of the face, armpits, pubes, and other regions begin to grow. The congenital origin of these tumors should, however, not be forgotten, and it is only the stimulus of puberty which awakens them into renewed life. Dermoids grow over the eye, both at the inner and outer angles, in the ovary, and in other situations of the body in which developmental errors may occur on account of the turning in of a portion of skin during the development of the embryo.

[NOTE.—Dr. Joseph McFarland subsequently examined the specimen microscopically, and reports it to be a dermoid.]

CASE VIII.—Our next case (Figs. 6 and 7) is a particularly sad one, as it represents a form of tumor entirely different from that just seen and is frightfully malignant in character. Only yesterday, in my didactic lecture on tumors, I spoke of the rapidity of growth in sarcomata and carcinomata. Particularly is such the case with the first-named variety of tumors; and here again the clinical history of sarcomata varies with the type of the disease; for be it distinctly understood that there are several varieties: the spindle-celled, the round-celled, and the giant-celled growths. The round-celled is the most malignant, the giant-celled the least so, and the spindle-celled is between the two in severity. This case has been introduced for a special reason, inasmuch as it gives you ocular demonstration of one of the general laws concerning tumors announced to you yesterday,—that is to say, that the more rapid the growth of a tumor the sooner it undergoes secondary or degenerative changes. This tumor has grown very rapidly, and yet after only a few months' duration has freely ulcerated. From the ulcerated surface there is a copious discharge, and from time to time there has been hemorrhage. What a blessing it would be if the next hemorrhage would end the life of the poor little sufferer, for it is impossible for her to recover. Benign tumors, on the contrary, grow very slowly, and much more rarely undergo retrogressive changes. You may ask if nothing can be done for this unfortunate child. Absolutely nothing, for the evidence is quite conclusive to me that I am dealing with a small round-celled growth, which is the most

malignant of all neoplasms. Operation is out of the question; it would be necessary to remove the entire head of the child to get beyond the limits of the tumor. The injection into the tumor, from time to time, of the toxins of erysipelas might possibly be of benefit, yet I have never known a good result to follow such treatment in this type of tumor. In the small spindle-celled sarcoma the treatment is of decided benefit, and I have known one cure to result in my own practice and distinct betterment to occur in several other cases. Eighteen months ago the wife of a prominent naval surgeon came to me with a tumor of the parotid gland, which had been twice operated upon by a distinguished surgeon of New York and had promptly recurred after each operation. Believing it to be a favorable case for the use of the toxins and an unfavorable one for further operative interference, as it seemed to be a small spindle-celled sarcoma, I injected it from time to time with the toxins of erysipelas and the bacillus prodigiosus, and was gratified to see an improvement at once. This improvement continued and the patient is now well, so her husband told me less than a month ago. I wrote to the surgeon who removed the former growths, and he promptly informed me that my clinical diagnosis of spindle-celled sarcoma was correct, as shown by the microscope.

How will the life of this little patient be terminated? In all probability it will be either by hemorrhage, cachexia, or metastatic deposits in the lungs, brain, or liver. Sarcomata are generalized by means of the blood-vessels, not through the lymph-channels; therefore metastases, if they do occur, will be in the lungs or other internal organs where the capillaries are small, the minute emboli being arrested in the smallest capillaries and there proliferating into secondary growths like the primary focus. Cachexia results in this form of tumor just as it does in cancer. There is an ulcerated surface, septic absorption through it may happen, and this explains the occurrence of the so-called cachexia. There is another very interesting clinical feature in connection with this case,—namely, apparent fluctuation at several points over the tumor. This is frequently the case in the soft, succulent, rapidly growing round-celled sarcomata, for in this class of growths there are many cells, little stroma, and great vascularity. I have known the ablest diagnosticians to be deceived time and again, and when tempted to aspirate at any particular point in a tumor of like character, expecting to find

fluid, have always been disappointed. It is to me the most characteristic sign of this form of neoplasm, and at times quite diagnostic.

CASE IX.—The following and last case (male, white, twenty-two years of age) that I bring before you is one of anal fistula, which is of very common occurrence. It is almost invariably preceded by an ischiorectal abscess. This may break externally, as in this case; also into the rectum; and under such circumstances there will be both an internal and an external opening, or what is called a complete fistula. More rarely it may break into the rectum, or externally through the skin, forming what is called a blind external or blind internal fistula, as the case may be. The internal opening is usually found low down within half an inch of the verge of the anus. Many look for it too high, and on that account utterly fail to find it. This is unfortunate, for if an internal opening be made, and the original opening not discovered, relapse is very apt to occur; therefore one should search patiently for the internal opening, and I am going to do so in your presence to-day. To be candid with you, I searched for it yesterday in the ward and failed to find it, yet it is my belief that there is an internal opening, for I feel an indurated mass just within the sphincter and in it there seems to be a depression, and from my experience in other cases I am led to infer that the internal opening will be found here. I now put the patient in the lithotomy position, which I prefer to all others in rectal work. I introduce my left index-finger into the rectum, and with a probe explore the sinus. It passes at once down to but not into the gut. I take it out and curve it so as better to follow the sinuous track, and yet I again fail to find the internal opening. Sir Benjamin Brodie, in his day one of the greatest authorities upon rectal diseases, insisted that when the surgeon found himself getting impatient because he could not find the internal opening, he should at once desist and wait for another examination. To facilitate matters it is my custom in such cases to inject the fistulous tract with a colored fluid. If the fluid passes from the sinus into the rectum and out of the anus, I know that I am dealing with a complete fistula. The best of such fluids are milk, ink, and potassium permanganate; the latter being antiseptic, of course I will use it. I inject the sinus with some of the permanganate which we used for our hands, and you will at once see that it does pass into the rectum and out of the anus. I there-

fore know that there is an internal opening, and I again carefully search for it. This time I find it, for it has perhaps been opened up and enlarged by forcibly injecting the permanganate. I am particularly glad to have made this demonstration in your presence, for I am sure that it will prove to be a valuable and abiding lesson. I now substitute for the probe a grooved director, and bring the end of the director out of the anus. With one stroke of the knife I cut all superlying tissue, which includes skin, superficial fascia, and the sphincter ani muscle. As I do so you all see the black fistulous tract which has been colored by the injection of permanganate. A more perfect demonstration of a fistulous tract could not possibly have been made. I am now going to do what I have rarely attempted: dissect out the fistulous tract and close the wound by primary suture. This new treatment is applicable only to recent fistulae in good-conditioned subjects. The patient before you is young and in a well-nourished condition; the fistulous tract is comparatively small and recent, and, in my judgment, there is little doubt that I can remove all diseased tissue and close the wound by suture. This I do with chromicized catgut. The bowels will be kept confined for several days and the patient fed upon liquid diet. I shall report to you as to whether or not primary union has been secured.

## A CASE OF LOCALIZED HYPERTRICHOSIS; TRAUMATISM OF THE ELBOW SIMULATING FRACTURE, FOLLOWED BY INFECTION; CARE NECESSARY IN HANDLING SYPHILITICS.

A CLINICAL LECTURE DELIVERED AT THE BELLEVUE MEDICAL DISPENSARY.

BY FREDERIC GRIFFITH, M.D.,

Surgeon, Bellevue Dispensary; Fellow of the New York Academy of Medicine; Assistant Surgeon at the New York Polyclinic School and Hospital; Assistant Surgeon (G. U.), House of Relief (New York Hospital), etc.

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GENTLEMEN,—CASE I.—It is a common occurrence for patients suffering from general diseases like syphilis and the fevers to be attacked by alopecia, the explanation being that the hair is cast because nutrition to the hair-follicles is directed to more important channels of the body. Stimulation or hypertrophy of hair growth accompanying nutritive changes in the reparative process is a rarer condition.

The following is the history of a localized overgrowth of hair which accompanied repair after traumatism. C., a boy aged fourteen years, four months ago sustained lacerated and contused wounds of the fourth and fifth fingers of the right hand by being caught in a train of cogs. The boy fainted at the time and again when removed to the hospital, where general anaesthesia became necessary to clean up the injuries. An attempt was made to save the fingers, and wet bichloride gauze dressing was used during an eighteen-day stay in the hospital, after which hydrogen dioxide for cleansing, rubber tissue strips and dry gauze were employed, until at the present time we have secured complete healing, though the fingers are stiff, slightly flexed, and distorted.

The first day after discarding the large wet dressing the boy noticed and cut off with scissors a growth of dark-colored hair, thin, fine, and over half an inch long, upon the back of his hand and fingers. The hand at present shows a growth of dark-brown hair of the size and length common in a man of thirty. The terminal phalanges have no hair upon them and the posterior aspect

of the fourth and fifth fingers is similar in appearance to lanugo. The left hand and fingers contain no hair. Besides a moderate development of brown hair upon the scalp, eyebrows, eyelashes, and a fine, colorless hairy growth upon the extensor surfaces of the forearms extending as far as the shirt-cuff, there is no other hair upon his body, the axillæ, scrotum, and pubes being entirely nude (Figs. 1 and 2).

CASE II.—L., male aged ten months, toppled from his high chair and struck upon the right elbow. Swelling which came on rapidly after the injury and pain being unrelieved after two days' treatment with domestic remedies, the child was taken to a physician, who, diagnostinating fracture, applied straight splints. This treatment was continued for a week with no apparent improvement. The doctor then advised operation, and, declining further responsibility in the case, referred the mother to Bellevue Hospital.

Upon examination I found the arm œdematosus to the fingers' ends, with more marked swelling about the elbow and upper arm. No abrasion or contusion was apparent anywhere on the skin. After my study of the case I doubted the presence of fracture. Applying a wet dressing, I bandaged the arm in a flexed position and secured elevation by means of a sling, bidding the mother wet the dressing many times during the day with water as hot as could be used with safety. In two days swelling in the forearm had entirely disappeared and was confined to the lower half of the upper arm and inner side of the elbow. At the next visit, from the hardened condition of the swollen area on the inner side of the joint which extended over the anterior surface, and the reddened skin which until this time had showed no sign, I suspected that infection was present; but, as the child's general condition had improved so markedly under the hot-water fomentations, I deferred making an incision until certain of my position. The woman was ordered to return the child next day, but failed to appear until the day following, when she reported that the night before "half a teacup of matter" had come away, she having removed the dressings. I found a small, circular, not inflamed opening over the insertion of the deltoid muscle, far removed from the localized, previously noted site of inflammation, which was still in a caked condition and seemed unaffected by the release of the infected matter from above. With a guarded bistoury I made an

FIG. 1.—Hypertrichosis following injury to the right hand.



FIG. 2.—Left hand, for comparison.





incision into the infected mass, resulting in an outpouring of dark bloody fluid apparently undergoing purulent disorganization. My incision seemed to connect with the general pus-cavity above, and after washing out with hydrogen dioxide I inserted small drains made of rubber tissue. From this time recovery was uninterrupted.

This case is of interest from the stand-points of differential diagnosis and treatment. In young children with soft bony structures the diagnosis of fracture is often made on faith. Pain and swelling, which are such constant symptoms of traumatism to the almost embryonic tissues of a baby, often mislead, and in endeavoring to give the least pain we treat the part as though it were the more important injury. By so doing if we err it is upon the side of safety, except in the presence of infection. The value of a more exact study of the temperature in cases of this nature, beyond the mere empiric knowledge gained from the mother's observations, must not be overlooked. Neglect of detail in examination, excused on the ground of the great numbers of patients at our hospital clinics, must sooner or later lead to unfortunate results. In the treatment of such obscure injuries in infants it is important not to leave dressings on too long. Disorganizing changes, so rapid in the young, may take place unnoticed under our elaborate dressings, working irreparable harm; hence simple, light dressings frequently changed are to be recommended.

CASE III.—The history of a case of what might have been an innocent infection by syphilis, in the person of a physician who is at present under my observation, is of importance as illustrating the caution necessary in handling syphilitics.

H. is a physician who had the subject of the following record under treatment. A. A., male, aged eighteen years, a shirt-maker by occupation, observed a sore on his frænum after intercourse which had taken place on two separate occasions four and six weeks previously. Induration was present; later developed glandular enlargement of both groins, in the postcervical chains, and in the epitrochlears. Alopecia occurred, but there was no pathognomonic eruption. Chronic sore throat came on, with bilateral enlargement of the associated lymphatics, about one month after the appearance of the initial lesion. Small mucous patches appeared subsequently upon the tip and under side of the tongue and at the bottom of the sulcus between the lower jaw and the

lip. A gradual enlargement of the tonsils occurred at this time. With the appearance of the secondary lesions antisyphilitic treatment in the form of the protiodide of mercury, one-quarter of a grain, three times a day, increased to half a grain; reduced and continued in doses of one-quarter of a grain four times daily, was instituted, and save for the tonsils, which remained of constant size, general bodily improvement took place. Swallowing and breathing being interfered with, double tonsillectomy was performed four months after the throat symptoms appeared.

With the performance of the operation begins the interest in the personal history of H. The instrument used was new and of Mathieu's spear pattern. No pain was felt by the patient and but moderate hemorrhage ensued. A moment after the patient had departed, H. took up the tonsillotome to wipe it off previous to sterilization, and in so doing pricked the ball of the middle finger of his left hand with the blood-stained spear of the instrument. By means of squeezing, the application of a ligature, and sucking, comparatively free hemorrhage was produced from the pin-point puncture. No pain was felt at the time of the accident or subsequently. Seeing the wound an hour after the accident it presented to view a small punctured orifice, and I simply advised watching. A week later the wound had entirely healed; on close examination a small pearly scar was apparent beneath a ring of epidermis, which could be peeled off similar to a small dried, ruptured vesicle. It is now four months since the above took place, and no signs of syphilis have appeared in my professional patient.

Accepting that A. was suffering from syphilis, H. apparently should have demonstrated the inoculability of syphilized blood. The spear-point being blood-stained, according to the positive declaration of H., why he did not develop a primary chancre, placing little value upon his measures of treatment at this time, is a difficult question to solve, unless, as has been put forth by some authors, syphilitic poison introduced into a vein or a lymphatic vessel may give rise to constitutional syphilis instead of a chancre as a primary lesion. It becomes a very fine point in the pathology of infection of an individual by syphilis to determine just how the poison is absorbed; that it does not remain localized during the entire period of chancre formation is attested by the results of a number of sur-

geons who have practised excision of this lesion without securing immunity from secondary symptoms in their patients. Whether the next capillary pulsation succeeding the introduction of the virus, or syphilitic germ, if such be the cause of this dread disease, to an abraded surface, carries the poison into the general circulation to be elaborated during the period of incubation; or whether absorption takes place more slowly through the opened lymph-spaces we cannot tell.

Sufficient time having elapsed for the appearance of a primary, or secondary, lesion in Dr. H.'s case, I am led to believe that his efforts in his own behalf at the time of accident were successful in throwing off the poison, and that he has demonstrated that there must be an appreciable interval of time after introduction before the absorption of syphilitic virus takes place. With this deduction, this report can have no better close than with a caution.

Careful handling of syphilitic patients by their medical advisers for their own personal protection cannot be too often advocated. Instruments should be boiled immediately after use upon this class of patients. Local treatment of mucous patches had best be made by employing wooden sticks as cotton applicators, tongue depressors made of the same material are likewise very cheap, and both can be destroyed by burning.

## THE SURGICAL TREATMENT OF INFANTILE PALSY.

BY JAMES K. YOUNG, M.D.,

Instructor in Orthopædic Surgery, University of Pennsylvania; Professor of  
Orthopædic Surgery, Philadelphia Polyclinic,

AND

JAMES KELLY, M.D.,

Resident Physician, St. Mary's Hospital.

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IN infantile palsy not all the muscles of a part are affected: only one muscle or one group of muscles is involved. Even in the more severe cases there usually remains a fair amount of power in the limb. Paralysis of certain groups of muscles causes certain malpositions of the foot, according to the group involved, owing to the loss of muscular equilibrium. The non-paralyzed muscles cause the part to assume various abnormal positions, from which result the different acquired deformities. To remedy these many operations have of late years been instituted. That which has stood the test of time is the grafting of sound tendons to unhealthy ones, so that the contractions of the non-paralyzed muscles, acting in the line of their new situations, will, after some education, perform practically all the normal motions of the foot.

In examining the deformity present, the position of the foot and its limits of motion in all directions should be ascertained. In selecting the non-paralyzed muscle for grafting, that one should be chosen whose action is most nearly allied to the affected muscle, so as to restore as far as possible the voluntary function of the paralyzed part. The nearest muscle having thus been selected, the patient can readily learn to use the functioning muscle in place of the disabled one, by means of certain exercises of the limb, by passive motions, by electricity, and finally by the aid of music, the latter being employed to cause the patient to step in time, and thereby obviate the limp which almost always attends such cases if thorough after-treatment be not instituted.

In this re-enforcing the paralyzed muscle or group, there is given a firm basis of support; at the same time the overaction of the non-paralyzed group, which partly caused the deformity, is lessened, so

that, instead of being an antagonist, it acts as a support. Another good result obtained by tendon-grafting is the partial, and later the complete, elimination of unsightly, cumbersome, and expensive apparatus, and at the same time the nutrition of the parts increases and the circulation improves.

Formerly in cases of infantile paralysis with resulting talipes, the usual procedure was simply to cut the tendon of the contracting muscle and to lengthen it. Although this method retained the action of the muscle and improved the position of the foot, it also weakened the muscles. Tendon-grafting, on the other hand, although it is often combined with tenotomy of some of the contracted tendons, aims to aid the paralyzed muscles at the same time, and as far as possible to restore the normal equilibrium of the antagonistic groups of muscles.

When the tendon of the paralyzed muscle does not require lengthening or shortening, the best result is obtained by making a slit through the tendon parallel with its fibres, and stitching therein the tendon of the non-paralyzed muscle, after this has been detached from its insertion. In most cases, however, it will be found that the tendon of the paralyzed muscle is either contracted or elongated, requiring that it be cut obliquely and lengthened or shortened after correcting the position of the foot and then attaching the tendon of the functioning muscle.

In some cases, especially those that began in early childhood and in which, as a result of use of the limb in its faulty position, some of the bones have assumed unnatural positions and shapes, it is necessary to do an osteotomy or an excision before grafting the tendon. In still other cases, as in talipes calcaneus accompanied by great contracture of the plantar fascia, this fascia must first be divided, or the grafting may be deferred to a subsequent operation.

Interrupted sutures of fine chromicized catgut have given the best results. Some of the methods of grafting are illustrated below. (Figs. 1, 2, and 3.) Care must be taken not to introduce too many sutures, which might cause the death of a portion of the tendon. The ends of the cut tendons which have been seized by forceps must be removed, to avoid sloughing. After suturing the cut portions the sheath of the tendon should be united with interrupted catgut sutures. Two cases of talipes are cited below, with the results. (Case II. and Case III.)

Very often after spastic affections certain groups of muscles may sooner or later exhibit fixed types of deformity, arising from weakening of some of the muscles, with both contraction and at times contracture of their opponents. Usually such deformities affect an upper limb and render it useless. They are generally seen in spastic contractures of the elbow, wrist, and fingers with pronation of the forearm. The same condition is seen, though less frequently, in the knee and ankle, and very rarely in the hip-joints. If the deformity has existed for an extended period, in order to effect a cure by an operation it is necessary to consider (1) contraction of the muscles,

FIG. 1.

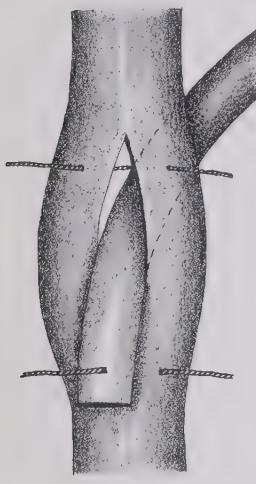


FIG. 2.

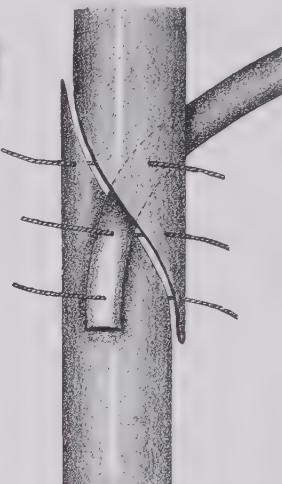
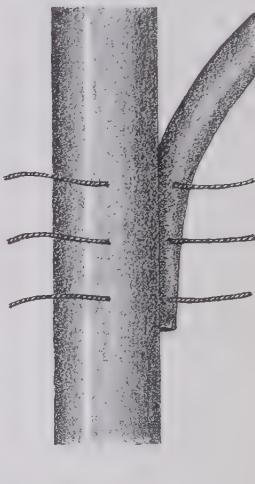


FIG. 3.



Diagrams showing the three methods of tendon grafting.

(2) contraction of the ligaments, and (3) contraction of the fascia. Usually the contracted muscles are divided, and the contracture of the ligaments and fascia can be overcome by passive motion and massage. Case I. is a good example.

While tendon-grafting has a very distinct future before it, it must not be employed indiscriminately; only in well-selected cases in which some of the muscles are non-paralyzed can it be of any use.

#### MUSCULAR CONTRACTURES FOLLOWING INFANTILE PARALYSIS.

CASE I.—D. W., aged eight, white, born in Pennsylvania, was admitted to the orthopædic wards of University Hospital on May 21, 1901.

*Family History.*—No tubercular history obtainable, and no history of alcoholism, rheumatism, neuroses, syphilis, or insanity in family. No deformities in patient's near relatives or ancestors.

*Previous Personal History.*—He has always been a healthy child, and has never sustained any injury.

*History of Present Condition.*—When eleven months old the patient had an attack of cholera infantum (?), after which it was noticed that in creeping along the floor he dragged the left leg after him. This uselessness of the limb has continued and steadily increased until the present time.

*Present State.*—On examination it is found that the left leg and thigh are in a position of flexion, abduction, and slight eversion. The head of the femur is discovered to be in its normal position, as shown by Bryant's triangle and Nélaton's line. On measurement it is found that the circumferences of the thigh, knee, calf, and ankle are considerably less than on the right side. The left leg, from the left anterior superior spine of the ilium to the left internal malleolus of the tibia, measures one and three-fourths inches less than the right. On placing the patient in the dorsal position and attempting to extend the leg and thigh completely, there is very considerable arching of the lumbar spine.

*Operation.*—One week after admission the patient was operated upon by Drs. Willard and Young. An incision one and a half inches in length was made one inch from and parallel with Poupart's ligament, and the sartorius and tensor vaginæ femoris muscles were divided. Attempts now to extend the thigh completely still resulted in arching of the spine. As the deep fascia of the thigh appeared to cause this arching to some extent, it was further divided inward towards the femoral vessels, and, starting from the outer end of the primary opening, a second incision was made at an acute angle, extending down the thigh for a distance of two inches. This second incision was made to afford the necessary room to avoid injuring the femoral vessels, and resulted in a V-shaped opening. Careful dissection was now made inward through the incision, the anterior crural nerve, the femoral artery, and the femoral vein were retracted inward and protected from any injury, and the psoas magnus and a portion of the iliacus muscles were divided. On attempts now being made to complete extension of the thigh, there yet remained some slight arching of the lumbar spine; so it was decided to do an oste-

otomy of the femur. An incision half an inch in length being made on a line with and three inches below the great trochanter, an osteotome was introduced and the femur cut; this resulted in a normal position of the leg and thigh. During the operation bleeding was very slight. The incision through which the osteotomy was performed was closed by means of a gauze and collodion dressing. The primary incision was packed with iodoform gauze and a dry sterile gauze dressing applied. Patient was then placed in bed, extension made, and immobilization secured by means of sand-bags. He was slightly shocked after the operation, and received hypodermically one-hundredth of a grain of strychnine sulphate and one-three-hundredth of a grain of atropine sulphate.

Convalescence progressed rapidly. The primary wound healed by granulation and the limb remained in good position. Six weeks after operation the patient was measured for a brace and shoe, which were applied ten days later. One week later he was able to walk with the aid of a cane and brace. The boy was discharged from the hospital three months after entrance; the position of the limb was normal and all movements were free. During convalescence he was daily treated by gentle massage and electricity. (Fig. 4.)

#### IMPLANTATION OF THE PERONEUS LONGUS TENDON TO THE TENDO ACHILLIS FOR TALIPES CALCANEUS FOLLOWING IN- FANTILE PARALYSIS.

CASE II.—D. W., aged six, white, native of Pennsylvania, was admitted to the orthopædic wards of the University Hospital.

*Family History.*—Negative.

*Previous Personal History.*—Has never been very healthy; has always had a tendency to catch cold; has sustained no injury. Had measles when two years old.

*History of Present Attack.*—Present condition has existed since six months after birth.

*Present Condition.*—Talipes calcaneus of right foot following infantile paralysis; muscles of leg are atrophied to a considerable degree, the peroneus longus being in the best condition on application of an electric battery.

*Operation.*—Three days after admission a curved incision, with concavity upward, was made below the external condyle, extending



FIG. 4.—Showing Case I., with brace and shoe applied. (After operation.)



from the median line posteriorly forward to a point one and a half inches in front of the external malleolus. The tendon of the peroneus longus was exposed and detached near its insertion and upward for one and a half inches from its surrounding fascia. The tendo Achillis was exposed and divided obliquely; its two cut ends were then shortened and stitched together with interrupted sutures of fine silk, except at a point in the middle of the cut, as shown in Fig. 2; through this opening the tendon of the peroneus longus was carried and stitched in place with interrupted sutures of fine chromicized catgut. The sheath of the tendo Achillis was next brought together with interrupted catgut sutures and the cutaneous incision closed with six silkworm-gut interrupted sutures. Aristol was dusted over the line of incision and dry sterile gauze and a plaster cast applied, the foot being in a position of slight over-correction. Patient bore the operation very well.

Seven weeks after operation, on taking off the cast, the incision was found to have healed by first intention and the sutures were removed. Another plaster cast was applied. Three weeks later the patient began to use a brace (ankle), the operation having been very successful.

IMPLANTATION OF TENDON OF THE EXTENSOR PROPRIUS HAL-LUCIS TO THE TENDON OF THE TIBIALIS ANTICUS FOR TALIPES EQUINO-VALGUS RESULTING FROM INFANTILE PARALYSIS.

CASE III.—E. G., aged eighteen years, white, native of Pennsylvania, was admitted to the orthopædic wards of the University Hospital on April 29, 1901.

*Family History.*—Negative.

*Previous History.*—No history of injury. The existing deformity followed an attack of infantile paralysis at the age of three years.

*Present Condition.*—The right leg from the knee down is much smaller than the left. In walking the right foot is abducted and everted almost to a right angle. Has talipes valgus and slight equinus. Power to flex and extend the leg is fairly good. Flexion and extension of toe are good. The right leg is about one inch shorter than its fellow.

*Operation.*—The patient was operated upon the day after ad-

mission. A transverse incision one inch in length was made anteriorly at the bend of the ankle. The tendon of the extensor proprius hallucis and that of the tibialis anticus were exposed just below the anterior annular ligament and freed from their sheaths for the distance of an inch. The tendon of the extensor proprius hallucis was divided one inch below the anterior annular ligament, the tendon of the tibialis anticus was cut through for the distance of half an inch in the line of its fibres, and the tendon of the former inserted into the button-hole incision of the latter and stitched in place by two sutures of fine silk. The sheath of the tibialis anticus tendon was then reunited with two catgut sutures and the skin incision was closed with two interrupted sutures of silkworm-gut. Aristol was dusted over the incision and sterilized gauze applied. The tendo Achillis was cut with a tenotome, aristol sprinkled over the punctured wound, and sterile gauze put on. The foot was then placed in a position of slight talipes calcaneus varus and a plaster of Paris cast adjusted, extending from the toes to two inches below the knee.

On removing the cast one month later, the incision was found to have healed by first intention. Two months after the operation a brace, with a stop-joint at the ankle-joint, was applied, and in two weeks more the patient could walk without its aid, but was most comfortable with it in place. The foot was in a perfectly normal position.

# Obstetrics

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## THE CONTEST BETWEEN THE ADVOCATES OF SYMPHSEOTOMY AND THE PARTISANS OF CÆSAREAN SECTION.

BY A. BOISSARD, M.D.,

Accoucheur to Tenon Hospital, Paris.

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THE truism that history is an everlasting repetition is strikingly demonstrated in the domain of obstetrics: after a period of a hundred years the struggle between the partisans of symphyseotomy and those of the Cæsarean section has begun again. Since controversies are less violent than formerly, we shall not witness the passionate disputes that divided the accoucheurs of the eighteenth century, when the faculty of medicine took beneath its protection its pupil Sigault who had in 1777 performed his first symphyseotomy, and when the faculty had to yield to the academy of medicine, represented by Baudelocque, whose opposition caused Sigault's operation to pass into oblivion and the question to appear settled for all time. Not only did Baudelocque have in his favor the authority and prestige which Sigault lacked, but he also had an easy cause to defend in upholding the Cæsarean party, as the successful cases due to his opponents' operation were rare, not to say altogether unusual. In those days symphyseotomy appeared to be a particularly serious and difficult procedure, full of risk and uncertainty; it would even seem that the lack of antisepsis in this not yet well-defined operation was more prejudicial and disastrous than with the Cæsarean section, which, owing to its rapid execution, nevertheless succeeded in some cases.

After having been abandoned in France for more than a century, symphyseotomy is now coming to the fore again, and it will be an unquestioned and legitimate source of satisfaction to Professor

Pinard to have wrested from unwarranted oblivion an operation that has its special indications. The revival of symphyseotomy would have occurred in France ten years sooner if the beliefs of our masters were not handed down from generation to generation unchallenged. Every one professed, without contradiction and without proof, that section of the pubic symphysis did not increase the anteroposterior diameter of the upper strait, or increased it only at the expense of serious lesions to the sacro-iliac symphyses or to the soft tissues. The success—or, rather, the fidelity—of the Italian school, especially of the school of Naples in the person of Morisani, finally roused the attention of the French accoucheurs, and the operation returned from Italy to France, where it had originated. Yet the success of the operation was not very great, since between 1855 and 1880 in fifty-three cases five women and ten children died, from 1881 to 1887 out of twenty cases eight women and five children died, and finally, in 1897, Morisani gave the death-rate of the mothers as 11.5 per cent.

Although, owing to improvements in the operative technic and to better antisepsis, success with this operation is now increased, it is still a serious affair, since the death-rate of the mothers is from eight to nine per cent. and that of the children ten per cent. These figures afford food for reflection, when we think of such a high death-rate in a normal function like labor, in cases where the symphysis is divided; surgical operations that give similar results are nowadays considered very serious, and surgeons have recourse to them only in urgent cases where there is absolute necessity, and where they have not the choice between several operations, as the accoucheurs have. So whenever we can choose we prefer not to resort to symphyseotomy, which we use only in cases where neither premature artificial labors, the forceps at the upper strait, nor turning can stand us in good stead. In a word, in our opinion symphyseotomy is an operation of necessity and not of choice; nowadays, however, the problem is undergoing a change, or is rather being broadened, so as to be posed in the following terms: in a case of contracted pelvis requiring symphyseotomy can we or ought we not to prefer the Cæsarean section? We have a presentiment that the revival of symphyseotomy will be followed by a revival of the Cæsarean section, and that it will not be long before

the partisans of the two operations will be publishing the outcome of their researches and also their statistics.

Syphyseotomy was the first to benefit by exact anatomical research, modifications in operative technic, and improvements in the antiseptic method. At the present time there is clearly a movement in favor of the Cæsarean operation, and it is probable that the exaggerations indulged in by the partisans of symphyseotomy will help to a considerable degree in reviving the Cæsarean section, of which the operative technic is simple and has been admirably drawn up. In the latter case the operator proceeds with absolute certainty, and nothing is left to chance; when the partisans of this operation are sufficiently armed with statistics and can publish their figures, we shall see in whose favor the scales will incline. But even now we can say that as regards the children the comparison is indisputably in favor of the Cæsarean section, which on general principles ought always to result in a living child; at most the infantile mortality should be very low. If we remember that the partisans of symphyseotomy claim special credit for saving the life of the child, it will readily be granted that in this particular the advantage is in favor of the Cæsarean section, since symphyseotomy, even in the most skilful hands, gives an infantile death-rate of one in ten.

There remains the question of the maternal mortality due to the two operations, for if we were to speak of the sick-rate, or of the consecutive or remote accidents, the advantage would still be in favor of the Cæsarean section, which when aseptically performed does not expose the patient to the risks that attend the extraction of the foetus after section of the pubis. The pubic section is an operation whose indications will gradually be more closely defined, while at the same time they will become more and more restricted. It is because the extreme limit at which the operation could be performed has not been clearly stated that bad results have been obtained and that the future of symphyseotomy has been compromised; we think that a few years hence in any pelvis contracted below sixty-five to seventy millimetres, the Cæsarean operation will be performed when the woman is at full term, as it is in our opinion dangerous or harmful, after section of the symphyses, to separate them more than forty-five millimetres, which will lengthen the anteroposterior diameter twenty millimetres. If further separation

be attempted, the almost inevitable result is damage to the soft tissues or to the sacro-iliac symphyses. We, therefore, think that before long, in delivering a woman at full term whose minimum diameter is less than seven centimetres, the Cæsarean section will be preferred to symphyseotomy. Then there remain the cases where the contraction is not seven centimetres, the woman always being supposed at full term; since, during the course of pregnancy, beginning with seven and one-half centimetres, we always prefer artificial premature labor, in which the mortality of the mother is zero.

For cases where the diameter of the pelvis measures more than seven centimetres, if the future shows that the results are as good as those furnished by symphyseotomy, or better, we shall no doubt witness a revival of the Cæsarean operation. At the last congress in Moscow, despite the very earnest defence made of symphyseotomy, based on many statistics, it was seen that the majority of accoucheurs preferred the Cæsarean operation, which we in France are only just beginning to become familiar with. For many of us Cæsarean section is still darkened by the deplorable results obtained with it in Paris before the antiseptic era, but a threefold modification in its operative technic has of late powerfully contributed to restore it to favor. These modifications are the method of haemostasis, the use of sutures, and the application of antisepsis. Haemostasis is obtained by operating outside the abdominal cavity,—that is, by enucleating the uterus through an incision in the abdominal wall, and applying a temporary ligature to the supravaginal region of the cervix, or, better still, seizing on either side the broad ligaments with the hands so as to control the uterine and utero-ovarian arteries. For purposes of haemostasis we may possibly in the future perform Cæsarean section after a spinal injection of cocaine, as recommended by Doléris. Finally, we now have in the subcutaneous or intravenous injection of serum a powerful means of treating the loss of blood resulting from profuse hemorrhage.

As the peritoneum does not well tolerate solutions of sublimate or other antiseptics, only boiled water and cloths and instruments sterilized by heat should be used in the operation, and the hands must be previously scrubbed, soaped, and dipped in alcohol, permanganate, and sublimate, in a manner that is now understood by every one and concerning which all are agreed.

The matter of sutures has now been very much simplified, and nobody at present would dream of freeing a zone of the uterine peritoneum or of removing a slice of the muscle according to Sänger's method. One of the chief factors in success is quick operating, as thereby the woman is exposed as little as possible to shock, hemorrhage, and infection.

Before performing our first Cæsarean section in 1897, we had seen three done, and they were all followed by the death of the mother; since 1897 we have personally performed the operation three times, and the mother and child lived in each case. If now we look at the statistics of those who have performed the greatest number of Cæsarean operations, we find in one hundred and seventy-four cases eleven deaths of the mothers, which makes 6.32 per cent., and nine children, or 5.45 per cent.

# Diseases of the Ear

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## DEPOSIT OF CHALK IN THE TYMPANIC MEMBRANE; A CASE OF MASTOID DISEASE DUE TO SMALL- POX.

CLINICAL LECTURE DELIVERED AT THE POLYCLINIC HOSPITAL.

BY B. ALEX. RANDALL, M.A., M.D.,

Clinical Professor of Otology in the University of Pennsylvania.

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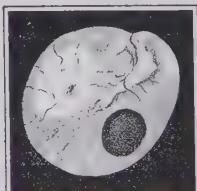
GENTLEMEN,—In this case, which I ask you to study with me, we learn upon examination through the canal several facts which bear upon the past history and the prognosis as well as upon the present diagnosis. We note upon the lower wall of the canal a white plaque, snowy and irregular, hard to the touch, and not easily removed. Moisture dissolves it (Fig. 1), showing that it consists

FIG. 1.



Thick-edged perforation with adjacent incrustation of boracic acid down and forward; chalk plaque up and back.

FIG. 2.



Boracic incrustation dissolved and chalk deposit traversed by injected vessels after touch with probe.

of crystals of boracic acid. This is a result of the previous treatment, and informs us that the discharge previously complained of has not been copious enough to wash away the boracic powder which was then insufflated, and yet there has been sufficient moisture to dissolve it for recrystallization. We know, then, that there has been discharge, but only of slight amount. Beyond this we see a

free perforation of the lower part of the drum-head, with thickened yet sharply defined margins. Above and back of this a yellowish-white area might be mistaken for more boracic powder, but the trained eye recognizes it as chalk deposited in the drum-membrane and the moist cotton does not change its appearance or remove it. This tells of long-standing involvement; for, while such a chalky plaque might come into view in a few days, we may be sure that six months and possibly six years were required for its formation. It has not the snowy whiteness characteristic of such collections, because seated in the middle layer of the drum-head; and, however prominent and bare they may appear, chalk deposits are always covered by skin-tissue externally and mucous membrane within. A touch of the probe would not grate upon the chalk, as might be expected from its appearance, but would cause a small extravasation with irritated filling of the blood-vessels (Fig. 2). It is the presence of such injection and skin-thickening that may for a time conceal these deposits and by clearing can within a few days uncover them to view. The appearance of the perforation also hardly accords with that of a recent opening; and questioning of our patient elicits the history that discharge began after sharp cold-taking eight years ago and has since been recurring at intervals for short periods. The present attack lasted but a few weeks, being brought to a close by a couple of treatments. Our tests show, however, that marked impairment of the hearing persists, which is not surprising in such a condition lasting for years, and we must not be too much disappointed if we find some of it beyond remedy. The pneumatic massage fails to produce any visible motion of the drum-head or malleus-handle; yet this, when supplemented perhaps by some vigorous mobilization with the probe, has frequently produced marked improvement of hearing, even in cases which had years before been pronounced hopeless by competent specialists. We will, therefore, continue treatment in the effort to relieve the impaired conduction of sound, which the tuning-forks inform us is the cause of the defective hearing; but you can see that most of what is elicited by the history could have been rationally inferred from our objective examination, and that the line of treatment depends largely upon these details, which many a patient would fail to tell us.

This second case, of a small boy with a suppurating ear and  
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great swelling of that side of the head, is of special interest, since it is the sequel of smallpox, now eight weeks past. The auricle (Fig. 3) is seen thrust far outward, forward, and downward by the red swelling behind it, and it needs but a touch to assure us that

FIG. 3.



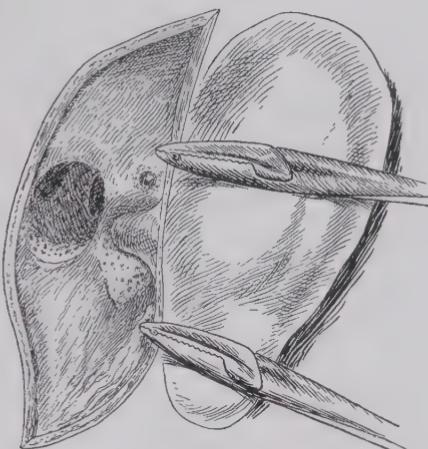
Displacement of auricle by swelling of mastoid, best seen from the back.

this is fluctuating and marks the retention of several ounces of pus. The flow from the canal is foul, reddish, and plentiful, and has continued, we are told, uninterruptedly since the middle of his variolous attack. The swelling of his ear has been steadily increasing since first noticed ten days ago. The tip of the mastoid, the postcervical triangle, and all adjacent regions are devoid of glandular swellings, so there can be no doubt that we have to deal with a mastoid abscess. This to me always means empyema of the mastoid with caries of the bony tissues, and the operation which I advise as urgently demanded without delay is expected to comprise the evacuation of the superficial pus-collection. Further, the fact of free outward penetration of the pus only lessens, but does not exclude, the possibility that the disease is advancing inward towards the brain, and that we may already find the dura extensively uncovered. The mother's desire to take the child home at once must wait upon the findings of our operation, as it would be unwise to allow the immediate removal of the patient if deep lesions are encountered.

The boy's head has been shaved, as you see, within a radius of

three inches of the external meatus, and after rigid cleansing a wet bichloride dressing has remained in contact for the two hours since he was first seen. We will repeat our cleaning with soap and water, ether, alcohol, and bichloride, for, although the case is undoubtedly septic, that is not a good reason why we should risk introducing any additional germs. Our hands and instruments being as sterile as they can be made, we will proceed to the operation.

FIG. 4.



Mastoid exposed by incision and reflecting of soft tissues, and opened by chisel close behind canal, showing within the uncovered dura posteriorly. Above the canal is the fistula.

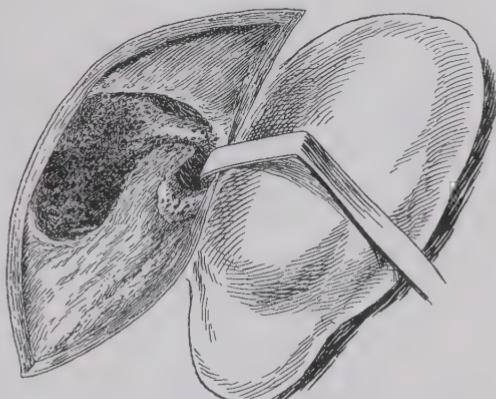
An incision from the tip of the mastoid upward close behind the insertion of the auricle gives a wound three inches in length, through which the pus escapes freely. Sweeping out the contents of the distended sac, we secure the blood-vessels and, sponging carefully, observe that the periosteum is largely intact except at a small point above the external canal. Laying bare the bone by lifting the periosteum, especially in the region of the spine behind and above the meatus, we find the bone-surface apparently normal except for a small loss of substance at the point just above the canal. This leads me to surmise that tympanic pus has broken through the roof of the drum into the cranial cavity and is now escaping through the squama at this point. The probe fails to enter to any depth, and before doing more in this region I will open the antrum, confident that it is full of pus and carious bone (Fig. 4). Having done this, we find posterior to it an opening through upon the dura,

and that the whole inner table forward from this point to the sinus noted above the canal is soft and infected. I remove this, therefore, uncovering nearly two square inches of the dura, and am glad to note that this brain-membrane shows a fairly healthy outer surface. Completing the cleansing of the walls of the mastoid cavity and smoothing the edges of the opening, for all of which you see that the curette has served me perfectly, we are ready to close our wound. In some cases this may be done after allowing it to fill with blood-clot, but, in view of the thoroughly infected condition of the superficial tissues, I doubt its wisdom in this case, and will pack the cavity with iodoform gauze, beginning in the antrum and gently supporting the uncovered dura throughout the bone-cavity, and then lightly distending the flabby pus-sac of the soft tissues. Stitches will not be required here, for the wound hardly meets my usual demand, that *its width shall be as great as its depth*, and without such freedom of access we might retard or vitiate the healing. The dressing will be changed in from two to five days, and at the second packing the bone-wound alone will require filling. Some time will be requisite for the closing in of the opening due to loss of substance, but I see no reason why this should not be complete and lasting. The suppuration from the ear will probably cease almost immediately, and the prognosis as to restoration of hearing will depend upon whether any irremediable damage has already been suffered in the tympanum.

This case is in several respects a marked contrast to that operated upon last week with the assistance of one of your number, wherein a secondary operation was needful by reason of extension of the trouble found five years or more ago. The canal had suffered stenosis, probably because of cowardly insubordination on the part of the patient preventing due packing, with the consequent incompleteness of healing and retention of cholesteatoma and pus. After trying in vain all mild measures, including rest in bed, to quiet the symptoms, I operated, thinking that relief of the soft-tissue stenosis might be all that was requisite. I found, however, that the bony opening of the cavities had been somewhat inadequate and a more radical exenteration of mastoid and tympanum was required. The upper wall was found to be destroyed, giving a small opening into the cranial cavity, which was enlarged so far as softened bony tissue demanded (Fig. 5). Then a pus pocket with

cheesy masses was reached, and its removal soon brought me to healthy brain-tissue in all directions. No dura was present over the bony opening, and whether the pus collection was upon or in the brain substance could have been determined only by a very much

FIG. 5.



Soft parts including the lining of the canal reflected forward, the mastoid freely opened, and this with the tympanum thrown into one with the canal by removal of the upper posterior wall. Above can be seen the opening into the middle fossa and brain-abscess.

more extensive removal of the bony walls, which did not seem desirable merely to gratify my curiosity. The cerebral cavity as well as the mastoid and the canal was packed with iodoform gauze. The patient has since progressed favorably and to-day shows fair progress towards cure, with a slight cerebral hernia through into the mastoid. For several days there was much malodorous discharge. This has already been controlled, but the case promises considerable difficulty because of the tendency of the canal to close again with a persistence hard to overcome in the obstreperous patient. So I may have to etherize once more in order to secure a free opening and the drainage by way of the canal which will be requisite for thorough and lasting healing.

# Progress of Medicine

DURING THE YEAR 1901.<sup>1</sup>

BY EDWARD WILLARD WATSON, M.D.

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As we read over the notable literature of the year, we can but note the steadily increasing activity shown in the field of true medicine. For twenty years surgery has had its own way and advanced with league-long strides; no similar period in the past has equalled this. But of late its step seems slower, and it pauses longer to polish its instruments and invent new stitches for the beneficent wounds that it makes. It has, it is true, during the past year made some new conquests. It has wrested from medicine the treatment of gastric ulcer, of cirrhosis of the liver, of intestinal perforation in typhoid fever, and has assayed Bright's disease with its suggestion of decapsulization, and generally, has, as in past years, wherever possible, shown itself ready to ignore the therapeutic for the operative procedure; fretting at delay and urging the immediate removal of cause, even though that might mean the removal of organs themselves. In short, the thoughtful observer could not help looking forward in fancy to the time when surgery and serums would dispose of all human ills. But looking deeper, a different condition of things is revealed. It is no wonder that *medicine*, as opposed to *surgery*, should more slowly respond to the incessant spur of the century. The factors of surgical success are easily recognized. Once let bacteriology and asepsis clear the way, and the knife cuts its path where we will it, and the coarse tissues are rudely trodden ground. True, not everything can be achieved by surgery. One cannot cure blindness by removing eyes, nor will the paralytic leap the better when his legs are scientifically removed, for beyond the gross manifestation of disease lies a world remote, minute, and

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<sup>1</sup> The writer is indebted to Henry H. Brown, M.D., Mary E. Lapham, M.D., and several others for the preparation of some of the abstracts of the papers incorporated in this article.

wonderful where the eye through the microscopic lens trembles to intrude and wanders bewildered, seeing yet seeing not. Here is the field for the medicine of the future, on whose borders it even now pauses, looking far into the distance as to a long-promised land; and therapeutics waits at the laboratory door impatiently on pathology and physiology; it drills its forces better, hour by hour, to meet each need as the need is known, to be ready when the word is spoken. Surgery is like the explorer treading new-found lands on earth, but medicine is the astronomer striving to master the secrets of a universe.

Research demands skilled workers and means, and time and place, and now the lay mind is awakening to its value, and we hear of an Andrew Carnegie founding an institute which is destined, we trust, to hasten the triumph of medicine by many days and take away at last the reproach of American scientific scholarship.

The readers of the CLINICS have been constantly supplied from volume to volume with the latest advances in medicine, such as the successful treatment of lupus and other dermatoses at the Finsen Light Institute and of locomotor ataxia by Frenkel's movement therapy, and with articles by the greatest of living writers, who are to-day making medical history. It, therefore, remains for the "Progress of Medicine" only to supply material not sufficiently touched upon by the contributors to the CLINICS in order that our readers may be put into possession in a compact form of what has been done during the past year in medicine and surgery.

The most widely discussed paper of 1901 was that by Koch on human and bovine tuberculosis, which was read at the Congress on Tuberculosis held in London last July. The reply to his paper was largely left to Dr. Ravenel, who has kindly prepared for us the article upon this important subject.

The mosquito origin of malaria being now well established, the medical profession was not greatly surprised to learn that yellow fever is also communicated by the same agency, though the experiments which were made with such magnificent courage by men of the United States army who voluntarily risked life to demonstrate the truth of this theory have been disputed by some observers.

The infectious character of rheumatism, purpura, etc., is being slowly developed. The establishment of the fact that a disease is

due to an organism at once increases the ultimate chance of finding a remedy therefor.

The development of tetanus after vaccination or the injection of diphtheritic antitoxin demonstrates simply the necessity of unceasing care in the preparation of these substances and the use of moderate care and common sense subsequently. If any further proof were needed of the value of anti-diphtheritic injections, it is supplied by the report of the Chicago Board of Health, covering a period of five years, which is given in detail later.

Among the new therapeutic agents recently introduced, for which new uses have been found or toxic effects discovered, we may mention acetopyrin, acoin (an eye-anæsthetic), acopyrin, actol (the lactate of silver), airol, albargin, argentamin, argonin, aspirin, asterol, bismal, bismuthose, brominol, calcium iodate, chirol, chloralose, chloretoe, cinnamic acid, cuprol (nucleinate of copper, less irritating than the sulphate), dionin (an adjuvant to atropine), dormiol, dymal, epicarin, euchinin, fango, guaiakinol, eunatrol, euguiform, eupyrin, formin, guacamphol, hedonal, helthin, ichthalbin, ichthargon, injections of nitrate of silver, iodocrol, iodomuth, itrol (the citrate of silver), largin, lysoform, mercurol, nargol (the nucleate of silver), nirvanin, pneumin, and pulmoform, protargol, sulphur bath, tannalbin, tannigen, tannoform, trional, urosine, vioform, and yohimbe.

Despite the failure of a large percentage of the medicaments recently introduced, the principal drug firms continue their investigations with new drugs, though their efforts are now directed more towards the union of well-known drugs and for the production of more palatable combinations.

The calamity of the year was the unexpected and unwarranted assassination of President McKinley at Buffalo, which threw a whole nation into grief and mourning. The assassinations of Lincoln and Garfield had back of them a history of events which partially explain their occurrence, but the murder of President McKinley at the height of his popularity and while in good health was one of those wanton acts which deeply stirred the whole nation and caused the treatment adopted to be most carefully scrutinized by every one.

## MEDICINE.

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### TUBERCULOSIS.

THE researches of Villemin and others showing the contagious character of tuberculosis demonstrated also the essential identity of tuberculosis as seen in man with that developing in the lower animals. This idea was opposed by Virchow in numerous papers, in which he pointed out at length the difference in pathological anatomy between "*Perlsucht*," the type of bovine tuberculosis, and human phthisis. In 1882 the discovery of the tubercle bacillus by Koch appeared to settle the question definitely for all time, and as for some years no one seemed to doubt the identity of the human and bovine tubercle bacilli, belief in the intercommunicability of the disease as seen in man and cattle followed naturally. Clinical reports of infection of young persons and children, in which the evidence seemed clear, have not been infrequent, and on the other hand a few apparently well authenticated cases have been reported in which cows became infected through the sputum of tuberculous attendants. In 1896 Dr. Theobald Smith called attention to certain differences in the bacilli obtained from man and from animals; more complete studies reported in 1898 confirmed his former observations, and led him to classify them as distinct varieties or races, though his experiments "show unmistakably the close relationship existing among the various cultures studied." In spite of his findings, however, he was not inclined to deny all danger to man from tuberculosis in cattle, but stated distinctly his belief that under "certain unknown favorable conditions" children might become infected through milk, and recommended "rigid, periodic inspection, and the removal of all cows with suspicious udder affections and all emaciated animals." It may be said briefly that for some years past the consensus of scientific opinion has been that man can and at times does contract tuberculosis from cattle through the use of their flesh and milk, especially the latter, and many investigations have been carried out with the object of determining the degree of virulence of cow's milk, and the period of disease at which it becomes bacillus-bearing rather than of establishing the possibility of infection, this being accepted as proved. So, too, much labor has been spent in determining the thermal death point of the tubercle bacillus in milk, largely in order that precautions could be intelligently taken for the protection

of bottle-fed babies. This view being the one almost universally taught in schools and text-books, and accepted by the vast majority of persons both lay and professional, the astonishment caused by Professor Koch's announcement at the recent Congress on Tuberculosis in London can be understood. He makes two propositions:

1. "Human tuberculosis differs from bovine, and cannot be transmitted to cattle."

2. "Though the important question whether man is susceptible to bovine tuberculosis at all is not yet absolutely decided, and will not admit of absolute decision to-day or to-morrow, one is nevertheless already at liberty to say that, if such a susceptibility really exists, the infection of human beings is but a very rare occurrence. I should estimate the extent of infection by the milk and flesh of tuberculous cattle, and the butter made of this milk, as hardly greater than that of hereditary transmission, and therefore do not deem it advisable to take any measures against it."

1. The first proposition is based on experiments carried out with Professor Schutz of the veterinary college in Berlin. A number of young cattle, nineteen in all, which had stood the tuberculin test, and might be regarded as free from tuberculosis, were infected in various ways with pure cultures of human tubercle bacilli. Some were fed with tuberculous sputum almost daily for seven or eight months; in some the bacilli or sputum were injected under the skin, in others into the peritoneal cavity, in others into the jugular vein, while four were made to inhale great numbers of bacilli with the spray of water in which they had been distributed. None of these animals showed any trace of disease when killed in from six to eight months. All had gained weight. At the point where the injections had been made small suppurative foci had formed in which a few tubercle bacilli could be found. On the other hand, when cattle were infected with tubercle bacilli obtained from the lungs of an animal with bovine tuberculosis, rapid involvement of the internal organs followed, whether the inoculation had been made under the skin, into the peritoneal cavity, or into the circulation. Some died in from a month and a half to two months: others were killed in a miserably sick condition after three months. A similar difference in virulence was found in experiments on swine, asses, sheep, and goats. These results are similar to those obtained by Smith, Dinwiddie, Frothingham, and at the laboratory of the State Live Stock Sanitary Board of Pennsylvania, except as regards swine, which appear to be equally susceptible to both types of tuberculosis.

We must take issue with Professor Koch, however, in the positive

manner in which he makes his sweeping assertion that "human tuberculosis cannot be transmitted to cattle." Indeed Professor Thomassen, of the Veterinary College, Utrecht, Holland, reported at the same Congress his success in doing what Koch says is impossible. A calf four weeks old was inoculated by Professor Thomassen in the anterior chamber of the eye with a pure culture obtained from a case of tuberculous arthritis in man. An intense keratitis followed, the cornea becoming so opaque that it was impossible to observe the alterations in the iris. The calf was killed after six weeks and was found to be the victim of a pretty well generalized tuberculosis. Both lungs contained numerous miliary tubercles and some gray fibrous tubercles of larger size. The path of infection from the eye to the lung was mapped out by the condition of the subparotid, cervical, mediastinal, and bronchial lymph glands of the same side.

In support of his position Professor Koch quotes Chauveau, Günther and Harms, and Bollinger as follows: "If one studies the older literature of the subject, and collates the reports of the numerous experiments that were made in former times by Chauveau, Günther and Harms, Bollinger, and others, who fed calves, swine, and goats with tuberculous material, one finds that the animals that were fed with the milk and pieces of the lungs of the tuberculous cattle always fell ill of tuberculosis, whereas those that received tuberculous material from human sources with their food did not."

Chauveau's classical experiments at present are so well known that it is hard to understand how Professor Koch could have made this statement. Chauveau's investigations were the first on this point; he succeeded in infecting cattle with human material in three ways,—by feeding, by intravenous inoculation, and by subcutaneous inoculation. Bollinger also, before the discovery of the tubercle bacillus, in one instance produced true bovine tuberculosis in a calf by the intraperitoneal inoculation of human material. Among others who have succeeded in producing tuberculosis in bovine animals by human material may be mentioned Klebs, Kitt, and Crookshank. At the laboratory of the State Live Stock Sanitary Board, of Pennsylvania, of four calves inoculated intraperitoneally with tuberculous sputum three became infected. Of these, two had persistent high temperature, but only one showed marked illness otherwise. Post-mortem examination showed that the lesions were quite extensive in two, and in one there was typical "grape" disease. Professor Sheridan Delepine, Procter Professor of Pathology, Owens College, Manchester, has reported experiments on this point made since the British Congress on Tuberculosis. He used the mixed sputa of several tuberculous persons. Four calves were

employed as follows:—one received five cubic centimetres of the sputum by injection into the lung; a second had the same amount injected under the skin of the leg; a third was given in one day fifty cubic centimetres in the peritoneal cavity. Two of the animals died too early for definite results to be obtained, but the other “two calves had contracted tuberculosis as the result of ingestion of or peritoneal infection with human tuberculous sputa.” We are therefore forced to conclude that cattle can be infected with human tuberculosis, admitting at the same time that infection rarely occurs under natural conditions, and that considerable resistance is offered by these animals to infection by tuberculous material from human sources.

2. The second point does not admit of direct experimental proof. Professor Koch bases the opinion there expressed mainly on the alleged rarity of primary intestinal tuberculosis, though as he says, “If the bacilli of bovine tuberculosis were able to infect human beings, many cases of tuberculosis caused by the consumption of aliments containing tubercle bacilli could not but occur among the inhabitants of great cities, especially the children.” . . . “That a case of tuberculosis has been caused by aliments can be assumed with certainty only when the intestine suffers first—*i.e.*, when a so-called primary tuberculosis of the intestine is found.” He says that he has seen only two such cases; that at the Charité Hospital in Berlin only ten cases were observed in five years; that among nine hundred and thirty-three cases of tuberculosis in children at the Emperor and Empress Frederick’s Hospital for Children, Baginsky never found tuberculosis of the intestine without concomitant disease of the lungs and bronchial glands; that Biedert found only sixteen cases of primary intestinal tuberculosis among three thousand one hundred and four children examined *post mortem*.

We are confronted at once with the question, Is it true that a tuberculosis conveyed through food must show itself first in the intestine? This is open to grave doubt from all points of view, and can be positively denied from certain points. (a) It seems certain that the tonsils often act as the port of entry for the tubercle bacillus, special facilities being afforded by the prolonged contact of milk with these organs. Thus Latham found seven cases of tuberculosis of the tonsils in forty-five consecutive cases in children from three months to thirteen years of age, examined *post mortem*. Conclusive evidence of the same kind has been furnished by Dieulafoy, Gottstein, Woodhead, Friedmann, and Baup. Latham examined the records of over three thousand cases, and found that the bronchial glands were most frequently the seat of the most marked lesions in children. This shows that lymphatic absorption must play an important part in the trans-

mission of tuberculosis to children. (b) Having reached the intestine the tubercle bacilli may pass through the intestinal walls with the chyle, and affect the mesenteric glands, or, entering the thoracic duct, may find their way into the circulation, to be deposited by election in the lungs. That this does actually occur cannot be doubted. We have accumulated experimental evidence of such passage which is convincing. We have produced a generalized tuberculosis with marked involvement of the lungs by feeding, while the most careful examination failed to reveal the slightest lesion of the intestine. We have had these results in cows, pigs, and puppies. The value of the statistics quoted by Professor Koch can then well be questioned. The figures given as those of Baginsky really mean nothing as quoted, for they give no clue to the starting point of the disease. As against them we may quote the very careful statistics of Dr. Shennan of the Royal Hospital for Sick Children in Edinburgh, and those of Dr. Still of the Great Ormond Street Hospital. Dr. Shennan believed the intestine to be the port of entry in 28.1 per cent. of his cases, while 29.1 per cent. of Dr. Still's cases were attributed to intestinal infection. These two series of cases include five hundred and forty-seven children, and certainly do not indicate that infection through the intestine is rare in the early years of life. It is to be regretted that Professor Koch did not quote these figures, as well as other statistics from his own country. The frequency with which intestinal tuberculosis occurs varies in different regions, pointing unmistakably to a local factor in each case. Thus Dennig states that in Tübingen it is rarely seen. This he explains by the general use of either cooked milk or goat's milk, the goat being by nature immune to tuberculosis. In Tübingen intestinal tuberculosis occurs in 14.7 per cent. of cases, while in Keil, according to Simmonds, in 31 per cent. In Munich, Biedert estimates it at 31.6 per cent., and Müller at 38 per cent. Professor Hueppe, in a recent paper, says, "The number of these cases (primary intestinal tuberculosis) occurring in children is by no means so small as Koch alleged. The number of cases may be fairly reckoned at between 25 and 35 per cent. of all the deaths of children from tuberculosis." Professor Hueppe believes "that the cases of primary tuberculosis of the bowel certainly represent only a minimum portion of the instances in which infection has been conveyed by way of the mouth with food." As pointed out above, we most certainly cannot consider as cases of infection by food, only those in which the intestine shows the primary lesion.

*Clinical Evidence.*—All cases so far reported as having been due to food are naturally open to some doubt, as it is impossible to exclude with absolute certainty all other sources of infection. It must be

acknowledged, however, that in many of them the evidence is equally as clear and positive as much that we are able to obtain in regard to the transmission of other diseases, and which we accept as conclusive without question. The most striking and best attested cases are those reported by Dr. Stang, of Amorback; by Dr. Demme, physician-in-chief to the Children's Hospital in Berne; by Dr. Gosse, of Geneva, and by Ollivier, of Paris. Dr. Gosse's case occurred in his own daughter, and so clear is the history in every detail that Nocard has well said "it has almost the value of an experiment."

*Statistical Evidence.*—The most striking evidence of this character has been collected by the late Sir Richard Thorne-Thorne from the records of the General Register of England and Wales. He speaks as follows:

"So also, if you will compare the rates in Tables A, B, and C (pages 5, 6, and 7), and contrast the reduction of 27.9 per cent. which has taken place, under five years of age, during the last forty-five years in all forms of tuberculous disease, and that of 66 per cent. in phthisis, with the corresponding one from tabes mesenterica, which only reached 3.0 per cent., you will see that in considering the latter cause of death we are dealing with a totally different state of affairs.

"The matter, too, assumes a still more serious aspect if we limit ourselves to the first year of life, when milk is most largely used as a food; for then we find that the reductions in the rate of death from the various forms of tuberculosis, which reduction has been going on at 'all ages' for about half a century, not only disappears, but is actually transformed into a large increase, reaching no less than 27.7 per cent. This in itself is grave enough, but its significance is still further emphasized when we remember the circumstances under which this increase in the rate of death from tabes mesenterica has gone on synchronously with a decrease in that from other forms of tuberculosis."

He does not hesitate to ascribe this condition of affairs to the lack of laws governing the dairy industry in England. Admitting all possible errors, we are still confronted with the fact that the death-rate from tabes mesenterica has increased largely, coincidently with a marked decrease in the death-rate from other forms of tuberculosis. Until some clear explanation is afforded, we are forced to conclude that the facts point directly to an infected food supply,—cow's milk.

*Accidental Inoculation of Man.*—The number of instances in which man has become inoculated with bovine tubercular material, or cultures of the bovine bacillus is sufficiently large to enable us to assert positively that the bovine bacillus is capable of multiplication in the

human body, with the production of its typical effects, even ending in death as in the cases of Walley, of Edinburgh, and Moses, of Weimar. Four cases of such inoculation have been observed at the laboratory of the State Live Stock Sanitary Board of Pennsylvania.

*Bacteriological Evidence.*—Studies of the bacilli from man and from bovine animals show certain differences in manner of growth and in morphology, but none of such marked and constant character as to enable us to make a positive diagnosis between the two by examinations of the cultures alone. For all experimental animals so far tested, the bovine bacillus has a much higher degree of virulence, and having proved that the bovine bacillus can and does grow in the tissues of man, it is reasonable to believe that this increase of pathogenic power holds good for man also.

Otherwise, we are driven to the anomalous conclusion that man, who is acknowledged to be one of the most susceptible of all animals to tuberculosis, is especially resistant to the most pathogenic type of the tubercle bacillus known. If this increase of pathogenic power were limited to one or two species of animals it might be claimed that it did not occur in the case of man, but, as a fact, all animals tried succumb more quickly to the bovine bacillus, the only possible exceptions being such animals as swine, which are so easily infected by both forms of the bacillus as to make it difficult to say which has the greater pathogenic power. In Koch's experiments, however, the bovine bacillus had much greater virulence for swine than the human. It is a striking fact, as Professor McFadyean has pointed out, that there is no known organism which is pathogenic for three species of animals which is not also pathogenic for man. The tubercle bacillus is absolutely unique in its range of pathogenic activity, no animal known being entirely resistant to its action. Even cold-blooded creatures have not infrequently contracted tuberculosis in zoological gardens, and the disease has been observed in fish kept in a stream into which sputum from a case of human tuberculosis was constantly thrown. Moeller succeeded in producing tuberculosis in a glow-worm by the inoculation of human sputum. The bacilli in the cultures recovered from the spleen of this animal after some time had the gross appearance of the avian tubercle bacillus, and grew best at 20° C., growth ceasing entirely at 30° C. From such facts as these we are able to say that the tubercle bacillus, however tenacious it may be of its characteristics in culture, is capable of a wide range of adaptability in nature. Even marked peculiarities of growth in artificial cultures, or striking temperature relations, do not permit us to speak with certainty of the pathogenic powers of any given bacteria.

From the evidence at hand we are forced to conclude:

(1) That human tuberculosis is transmissible to cattle under certain circumstances, both experimentally and under natural conditions.

(2) That bovine tuberculosis is transmissible to man by direct inoculation, and also through food, milk being the product most to be feared.

(3) That infection through food is confined practically to children, though adults should also take precautions against the use of tuberculous food products.

(4) That while we are unable to determine the exact proportion of cases of tuberculosis in man due to transmission from cattle, we must regard infection in this way as much less frequent than by the inhalation of dust containing tubercle bacilli.

(5) That transmission from cattle to man is of sufficient frequency to justify our endeavors to eradicate the disease from cattle, and to frame laws forbidding the sale of the milk and the flesh of tuberculous animals.

At the final meeting of the Congress at which Professor Koch advanced his theory a resolution was passed urging health authorities to continue their vigilance, and asking the government to institute a rigid investigation of the subject. A permanent national committee to collect evidence was also recommended, and while the committee appointed has made no report, it is stated semi-officially that it has not been able to confirm Koch's conclusions.

[NOTE.—While this article has been passing through the press, a large amount of evidence confirmatory of the view here taken has been published from various parts of the world. The most important single contribution is perhaps that of de Jong, of the University of Leyden, Holland. As the result of comparative experiments on a number of animals, including monkeys, he concludes that we have reason to believe that the bovine tubercle bacillus is more virulent for man than the human variety, and that, so far from relaxing our precautions against transmission from cattle to man, we should increase them.

A large number of new cases of accidental inoculation of man have been reported, several of them from Berlin. Having observed four cases of "verrucose tuberculosis" of the skin in butchers, Professor Lassar is inclined to believe that this type of skin tuberculosis is due to the bovine bacillus, an opinion which was agreed in by Leibrich and others.

At the laboratory of the Pennsylvania State Live Stock Sanitary Board a culture isolated from the mesenteric gland of a child has been found to be exceedingly virulent for cattle. Inoculated into the circu-

lation, a calf weighing one hundred and thirty-two pounds was killed in seventeen days. A second calf, weighing two hundred and two pounds, inoculated into the peritoneal cavity, died on the twenty-seventh day; while a grown cow inoculated both into the circulation and peritoneal cavity died on the seventeenth day; all showing the most typical lesions of acute miliary tuberculosis. This shows that the human bacillus sometimes has a virulence for cattle fully equal to the bovine, or else that the child from whom this culture was obtained was infected in the first instance by milk. The latter is probably the true explanation.—M. P. R.]

**RECENT LEGISLATION CONTROLLING TUBERCULOSIS.**—Pennsylvania has established a plan of coöperation between the State and the owners of tuberculous cattle by which herds are inspected at the expense of the State, and diseased cattle are separated under restrictions, or destroyed. In the latter case the appraisement of value must not exceed twenty-five dollars for common and fifty dollars for registered cattle. Disinfection must be done at the owner's expense. Tests and retests are made as required, and cattle from other States are quarantined until tested. Massachusetts has a more compulsory law. Illinois, New Jersey, Maryland, Delaware, Vermont, New Hampshire, New York, Michigan, Minnesota, and some other States have a protective law of some sort, and in many countries of Europe legislation has greatly limited the disease. The Bureau of Animal Industry, at Washington, see no reason why they should interrupt their work, sending out, as they do, thirty-five thousand to forty thousand doses of tuberculin each year.

In New York and Michigan compulsory notification regarding tuberculous patients is required. Publicity is avoided, as far as possible, and disinfection done at the expense of the municipality.

**SANITARIA FOR TUBERCULOUS PATIENTS.**—The public is becoming keenly—too keenly—alive to the infectiousness of this disease. But the sequestration of consumptives is a task of appalling magnitude. Koch, before the congress, stated that there were two hundred and twenty-six thousand consumptives, over fifteen years of age, in Germany, needing hospital treatment, and that as yet only twenty thousand could be accommodated. The magnitude of this burden, which would be thrown on the community, makes one pause and think. Already plans are being devised for coöperative sanitaria where patients can work, so far as they are able, and where the hopeless idleness which is so depressing is partially avoided. The Rocky Mountain Industrial Sanitarium has been established near Denver, Colorado. It is, as yet, in its infancy, but a great work may lie before it and similar

institutions. The United States Government has established a sanitarium at Fort Bayard, New Mexico. The State of Texas has an isolation camp for consumptive convicts at Huntsville. Free hospitals are established or are planned in Pennsylvania and Iowa. At St. Petersburg, Russia, a sanitarium will soon be opened, and at Teneriffe one is already in operation. In certain Western States it is proposed to go still further and have special cars for the tuberculous when travelling.

DISEASES FAVORING OR HINDERING TUBERCULOSIS.—Harper believes diet to be in a measure responsible for tuberculosis, calling attention to the marked immunity of carnivora. He also states that the disease is rarely found associated with gastric ulcer, pregnancy, eclampsia, or gout, while Harrison Beale records a case of phthisis arrested by gout. T. F. Riley, of New York, states that of one hundred phthisical patients all but six had at some time had acute articular rheumatism.

TUBERCULIN IN THE DIAGNOSIS AND TREATMENT OF TUBERCULOSIS.—E. L. Trudeau continues to advocate the use of tuberculin both as a remedial and diagnostic agent, never using it in cases of high temperature. E. A. de Schweinitz, in the *Medical Record* for January 4, 1902, is not so enthusiastic about its diagnostic use, quoting from Otis, who says that in a thousand cases only a small percentage showed any reaction.

TREATMENT WITH UREA.—Harper cites several cases of undoubtedly tubercle arrested or cured by the use of urea. The bacillus will not grow in bouillon to which urea has been added. Mr. Arthur H. Buck corroborates Dr. Harper, and reports a case of lupus vulgaris cured by urea.

TREMOR IN THE TUBERCULOUS.—Levi and Follet call attention to epileptoid tremblings as a symptom of pulmonary tuberculosis. They were able to discover it in nine out of fifty cases, none of which had atrophy, paresis, or myxœdema, active pulmonary disease being present in all cases. They believe this symptom to be caused by the action of toxins upon the spinal cord and that it indicates a mixed infection.

EXPERIMENTAL TUBERCULOSIS OF THE SUPRARENAL CAPSULE IN RELATION TO ADDISON'S DISEASE.—From his results in a series of experiments, De Vecchi (*Medical News*, November 2, 1901) found that tubercularization of the suprarenal gland in rabbits produced a fatal poisoning. The circulating poison exhibited intense destructive power not only over the heart, liver, and kidneys, but especially upon the cells of the central nervous system. He believes that these injuries explain the nervous symptoms exhibited in Addison's disease, and that there are

two factors in this diseased condition: (1) the gradual destruction of the suprarenal substance; and (2) an intense tuberculous infection. He was unable to produce bronzing of the skin, but feels that by his method of investigation the solution of the etiology of this disease has been approximated experimentally.

### SMALLPOX.

SMALLPOX, which has, notwithstanding modern methods, gained a foothold in London and in many cities in the United States within the past year, has been studied, with the allied subject of vaccinia, with but little result in the way of new discovery. For the past ten years there has been but limited opportunity to judge of the efficacy of our recent hygienic measures, and the world seems to have concluded that the disease was well under control and would trouble it no more. The recent wars, however, in South Africa and Cuba and the Philippines have probably resulted in spreading the disease in the home countries, and it has gained a substantial foothold. Whether the new repressive measures are not efficient or whether there are other undiscovered factors is an interesting question.

Vaccinia and variola have been studied by Funcks (*Deutsche medicin. Wochenschrift*, 1901, xxvii., and *American Journal of Medicine*, 1901) and the following conclusions reached: First, that vaccinia is not a bacterial disease but a protozoan infection, the causal agent being easily discovered in vaccinal pustules and lymph. The inoculation of these parasites in a sterile emulsion brings about in animals classical vaccinia and makes them resistant to further inoculation of vaccine. The pustules of variola contain a similar protozoon morphologically; hence vaccinia and variola are identical and vaccinia is only a milder form, and vaccine protection is only specific immunity.

Calmette and Guerin<sup>1</sup> have experimented to discover a method of controlling the virulence of vaccines of different origin and age. For their purpose they employed rabbits as less susceptible than calves or children. At present all vaccines passing through the Pasteur Institute at Lille are tested on the rabbits before distribution; a vaccine virulent for a rabbit is sure to be satisfactory for human beings. Vaccinal immunity is certain to be established in from five to six days, and their observations seem to show that the infectious agent does not multiply in any organ to which the leucocytes have access except the cutaneous surface.

They have not succeeded in obtaining cultures of the virulent agent,

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<sup>1</sup> *Annales de l'institute Pasteur*, 1901, xv.

but they note that when lymph, obtained with every precaution on the fourth day, is examined with the highest power there are very few bacteria found stainable by ordinary methods; but when examined unstained many minute motile granules are seen, which they suspect as the infectious agent, especially since they are not found in the blood or exudates of animals suffering from vaccinia. In glycerinized vacinal pulp they become larger and immobile. The better the virus the more numerous they are, so that in this way one may predicate the value of the virus from their numbers. Cultures gave no result.

A study of the blood in measles and variola by J. Courmont<sup>1</sup> reveals in the latter a mononucleosis invariably comprehending a certain proportion of myelocytes and of nucleated red-corpuses. Even in a case of a complication inducing polynucleosis the diagnosis is still possible by the presence of myelocytes. This formula of the blood never occurs in measles. Chicken-pox at times proves a very confusing factor in diagnosis, and when isolation is strictly enforced or removal to a hospital for contagious diseases, mistakes in diagnosis are disastrous. Dr. Spalding, in the *Monthly Bulletin* of the Health Department of Chicago, January, 1901, contrasts by photographs cases of varicella in the adult with those of smallpox (Figs. 1 to 6). He believes that diagnosis is often extremely difficult, but must be made; and he relies on the absence of prodromal symptoms, the thinness of the chicken-pox vesicle and pustule, its easy rupture, the appearance after three or four days of vesicles, pustules, and crusts at the same time, and a history of exposure to cases of undoubted chicken-pox. During an epidemic of smallpox, however, cases of mild varioloid will occasionally be found so closely resembling chicken-pox, so free from prodromata, that absolute diagnosis becomes impossible. Hence the propriety of reporting chicken-pox during a smallpox epidemic, and, where the cases are doubtful, their detention in some suitable place under limited quarantine until decided.

The year, as the above will show, has added little to our knowledge of variola. The question of the value of glycerinized lymph is as yet, to a certain extent, undecided; only the exposure of those successfully vaccinated with it in primary vaccinations and in large numbers will clear up the matter. The alleged discovery of the bodies in vaccine lymph described by Calmette and Guerin and their behavior in glycerin—the growing larger and losing motility—would seem to indicate, if these bodies should prove to be the agents of contagion, that some modification takes place, the smallpox germ being more

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<sup>1</sup> *Bulletin de la Soc. des Hôp. de Paris*, August 1, 1901.



FIG. 1.—Chicken-pox.

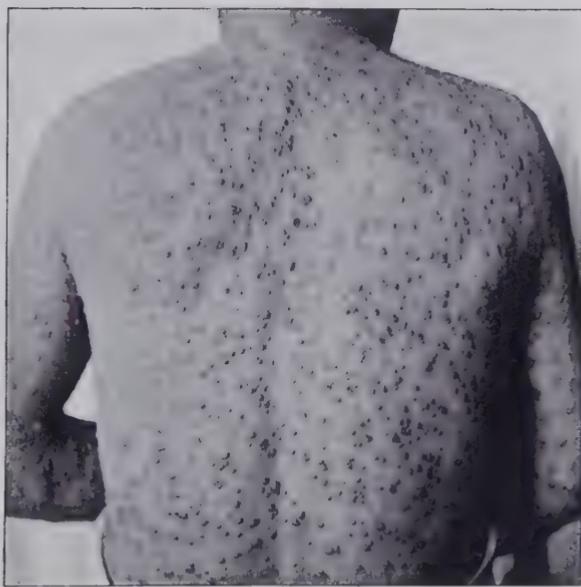


FIG. 2.—Smallpox.



FIG. 3.—Chicken-pox.

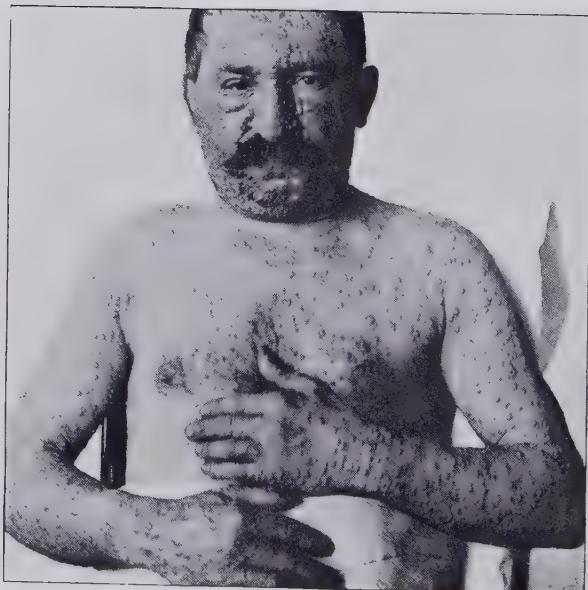


FIG. 4.—Smallpox.

resistant to glycerin than other germs. During the year the statement was made that after vaccination with this lymph the ordinary dry virus took as if in a virgin field, but that after the dry virus was used the glycerinized virus had no effect. This statement seems to have been thoroughly disproved. If it were true, it would show that the glycerinized virus had lost some protective power while retaining its ability to produce pustulations closely resembling those seen in ordinary vaccine.

The occurrence of tetanus following vaccination added for a short time another arrow to the scanty quiverful of the anti-vaccinationist. A very careful study, however, of the cases in Camden, New Jersey, was made by Dr. Robert N. Willson<sup>1</sup> and an investigation by the Camden Board of Health, with the resulting conclusion that the fault could not well have originated in the virus used, but must be sought in some subsequent infection from carelessness and filthy management of the vaccine sores or from some local climatic condition. The virus used in the tetanus cases was not all from the same source, and others vaccinated from the same virus in the vast majority of cases escaped. Incidentally there was exhibited a complete failure of antitetanic serum as a curative agent, all the more remarkable if the cases were infected at the time of vaccination, since the period of incubation was so much prolonged and, as so well shown in Dr. Wilson's paper, the cases of retarded tetanus showing a much lower rate of mortality than that which is usually seen.

The great increase in smallpox throughout the United States as well as abroad has led to a closer study of our present method of prevention. Much more activity has been displayed in the large cities than in past epidemics, yet with apparently less results—our methods to-day differ from the methods of twenty-five years ago in stricter quarantine, disinfection with formaldehyde gas and formalin, and in the wide-spread use of glycerinized virus.

Quarantine has been strictly employed in Philadelphia, but its abolition there has been recently agitated. Its expense is great; it shuts in the house members, exposing them longer to infection if it exists; it stops wage-earning and business; in cold weather prevents the free ventilation so desirable, and hampers the work of thorough disinfection. A general consensus of authority seems to show that, apart from previously infected clothing, those who ultimately succumb to smallpox are not themselves givers of infection till the initial fever occurs, and hence it is urged that prompt vaccination of all infected

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<sup>1</sup> Trans. Phila. Co. Med. Soc., November, 1901.

houses, prompt disinfection, and daily inspection at a set hour by a competent official would, if the original case be promptly removed to a hospital, make it possible for the other inmates of the house to go in and out without danger to the public. Warning might be put upon the dwelling itself, to keep out unnecessary outsiders, a general admonition to avoid crowded assemblies,—schools, churches, lectures, theatres, etc., given to the inmates would be an added safety, and a stringent rule that neither person nor goods should be removed from the infected house till the lapse of at least fifteen days. The inspector could visit the house every evening, take temperatures and pulse, and on the appearance of abnormal conditions sequester the individual till his case proved innocent or serious.

Formaldehyde and formalin—replacing the earlier sulphur dioxide fumes and to a certain extent the disinfecting oven—are worth still further and closer investigation. The spray of formalin is known to possess but feeble penetrating power, and the gas must be used in larger quantity than has generally been done to prove effectual for the destruction of recognized bacilli. Some experiments in car disinfection made lately seem to show this very decidedly. As for any certainty that it can destroy the germs of smallpox we look in vain. We may assume that the undiscovered variolous germ possesses great tenacity of life, judging it by the behavior of the analogous vaccine germ, which resists the action of glycerin for more than double the time needed to destroy other bacteria. As we, unfortunately, have never seen the germ of variola, its behavior in the presence of formaldehyde has not been and cannot as yet be studied. Summing up the whole matter, then, it seems possible that recent want of success in controlling smallpox may be due to some fault or faults in the methods employed. It might be added also that the very strictness of regulations, especially in quarantine and placarding, may lead to concealment of the disease, and thereby undo all the good gained by them.

#### DIPHTHERIA.

Diphtheria and its treatment by antitoxin have been forcibly brought to the notice of the general public in an unfortunate way by the recent outbreak of tetanus in cases where antidiphtheritic antitoxin had been used. These cases occurred in Italy (Milan) and subsequently in St. Louis, and will, we hope, have eventually a good result in more care being taken in the manufacture of this valuable agent of cure. The cases in St. Louis have been the subjects of a careful investigation and a manly report by the St. Louis investigating committee, published in the *Medical Fortnightly*, December 10, 1901. The conclusions

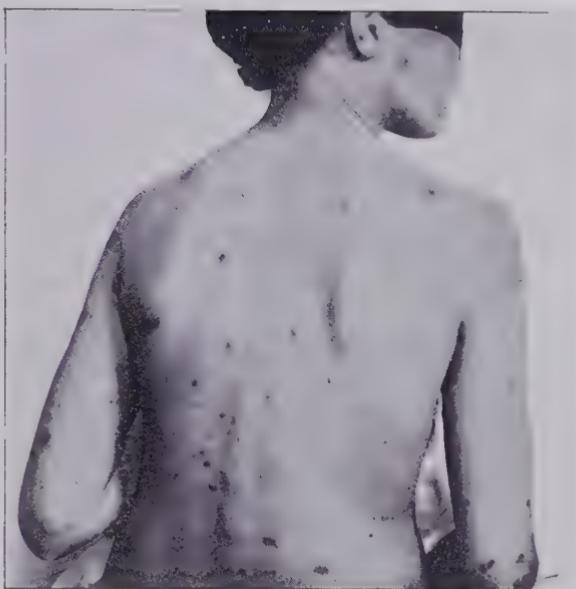


FIG. 5.—Chicken-pox.



FIG. 6.—Smallpox.



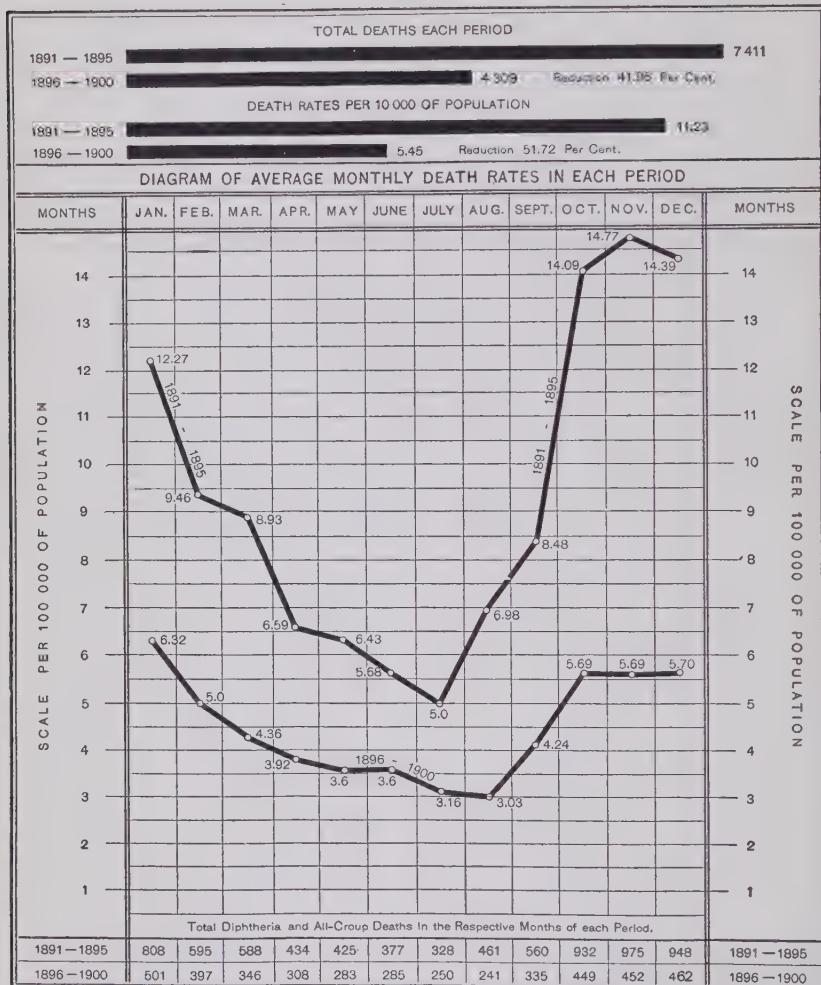
reached by them were, in substance, that the antitoxin which had been prepared by the city health department had been falsely dated, and on investigation was found to contain the tetanus bacilli in considerable number. Two different series had been issued under one date, one harmless and the other deadly, and the latter serum had not been properly tested either for its potency or its safety. The poisonous serum, it was reasonably concluded, had been drawn while the horse from which it was taken was in the incubation period of tetanus, which he developed some days afterwards. Had it been tested, it would have been rejected beyond a doubt.

The value of this investigation lies in the fact it makes manifest—that if the usual and ordinary tests had been made no cases of tetanus would have occurred. It strips the occurrence of tetanus of all mystery and, while deplorable, it should not for a moment prevent the use of reliable serum.

There is now already accumulated a vast mass of statistics favorable to antitoxin, and the evidence grows steadily. The Chicago *Monthly Bulletin* of the Department of Health publishes the results (Fig. 7) of this treatment in Chicago from October 5, 1895, to December 31, 1900. In October, 1895, the Board of Health took charge of the treatment of diphtheria among the poor of the city. During the preceding five years the annual average of deaths had been 1482, with a percentage of mortality of 11.23 per 10,000 of population. During the succeeding five years the average number of deaths was 862, the percentage per 10,000 of 5.45, a reduction of 41.96 per cent. in the number of deaths, and of 51.72 per cent. in the percentage per 10,000 of population. The department attributes the whole of this reduction to the prompt administration of antitoxin in full doses to every case that exhibited suspicious symptoms, without waiting for a bacteriological test. These figures one might perhaps question, on the ground that many suspicious cases seen early and looked for sharply might have been very innocent in character, and that cases seen early are cases where the parents and guardians are alive to anxiety and are more careful than in the neglected cases seen late. The department also only reached the cases among the poor, while diphtheria prevails also to a very wide extent among the more happily situated classes. The same thing may be said concerning the report of the relative percentages of mortality in cases seen and treated on the first, second, third, and fourth days, respectively,—viz., .42 per cent. for the first; 1.54 per cent. the second; 3.59 per cent. the third; 11.38 per cent. the fourth. The most valuable figures, however, are those which show that of three thousand nine hundred and thirty-six cases treated with full doses of antitoxin on the

third day or earlier there was a mortality rate of less than 2.5 per cent., while in the remaining fourteen hundred and ninety-one cases treated

FIG. 7.



Diphtheria and all-croup mortality in Chicago before and during antitoxin treatment. Pre-antitoxin period, 1891-1895; antitoxin period, 1896-1900. Upper line in diagram relates to the pre-antitoxin period; lower line to the antitoxin period. Figures in columns of months are the average monthly deaths per 100,000 of population. Figures at bottom of columns of months are the actual number of deaths for each five months in each period.

later the mortality was 19.05 per cent., showing that after the third day antitoxin can claim but slight results. The statistics of all cities,

are not as favorable as these, while some foreign and domestic observers, who are still unbelievers, claim in smaller series of cases a much lower death-rate, though employing no antitoxin. The truth lies probably between these two extremes, and to realize the actual value of antitoxin nothing else should be done in the cases to which it is administered. It may yet come to pass that antitoxin will in the future be discarded for a more complicated serum or for the combined use of many serums which will reach all the other organisms which sometimes cause clinical diphtheria—and death. In fact, if all cases of throat exudation, obstructed larynx, and threatened death were cured by antitoxin it would be incredible, for the mixed infections of throats which are classed under the general name of clinical diphtheria are many, and the antitoxin is an antitoxin to the disease produced by one bacillus alone. There being at least seven recognized organisms which are found alone or in combination in exudative sore throats, the mathematically possible combinations of these would be about five thousand.

As showing that there are still many unsettled points connected with this important subject we quote from the "Bacteriology" of Lehmann and Neumann:

"Important, but lacking confirmation, is the statement of Hewlett and Knight that they have succeeded in the London Institute of Preventive Medicine in converting the Hofmann-Wellenhof organism into the virulent diphtheria bacterium by passage through animals, and that typical virulent diphtheria bacteria may be changed into the typical Hofmann-Wellenhof organisms by careful heating."<sup>1</sup>

#### PLAUE.

Plague is a disease which is attracting steadily more serious attention and causing more apprehension. From 1846 till the last decade it had been all but forgotten in Europe, occurring only in isolated localities in short outbreaks, in Asia. Evidently, it must have persisted in the far East, hibernating as it were, or kept alive in small places or among such a scattered population as to be unnoticed by the world at large. Its behavior since its first appearance in recent times in Hong-Kong, has been such as to create a feeling of profound uneasiness. It has obtained a partial foothold in every direction, and even now may be occurring in an unnoticed form nearer than we imagine. It has appeared in several places in the Western world, and has ap-

<sup>1</sup> Transactions of the British Institute for Preventive Medicine, No. 1. Abstract in Centralblatt für Bakt. u. Parasit., xxiii. p. 793.

parently been "stamped out"; but has it been stamped out? Koch's statement that only the pneumonic form of plague is capable of establishing new foci of the disease may account for its disappearance in some places in a short time, while in other places, using the same methods, it tenaciously holds its ground. In this connection it will be remembered that high authority can be quoted for the statement that the pneumonic form cannot be diagnosed from influenzal pneumonia which it closely mimics save by autopsy and bacteriological test.

It has also exhibited peculiarities in its recent visitation for which we search in vain the pages of Hecker or other older authorities. In the Orient it has attacked Orientals and avoided Europeans, but it has been capable of epidemic form in Portugal among the white races. This trait led the Japanese authority, Kitasato, to imagine that, starting in one race the bacillus became so modified that its life in the blood of another race was difficult. Taken all in all, the plague remains the great menace of the world's future and is still mysterious. Many promising theories as to its method of propagation have bloomed and withered. The Western world, for awhile inconceivably ignorant and apathetic, slept the sleep of false security. Once it roused itself and said "rats" and went to sleep again, just now it has said "fleas," but the entomologist explains that the flea of the rat is not the flea of the man, and probably will not bite him at all. The one has a crest, the other has no crest; so we are like sentries posted at the wrong gate till we know how plague spreads.

Two very interesting papers on "The Viability of the *Bacillus pestis*" and "The Destruction of Rats by the Use of Danyz's Virus" have appeared during the year, while the Report of the United States Commission in San Francisco on the Bacteriology of Bubonic Plague throws still further light upon a dark subject.

Rosenau's experiments published in the Bulletin of the Hygienic Laboratory, United States Marine Hospital Service, Nos. 4 and 5, should be read by all interested in the study of the plague bacillus. Many of his conclusions are of extreme value if, as we anticipate, the plague will finally get a firm foothold in Europe and America. He concludes that it is not frail; it lives under 19° C., dies if dry at 37° C., and that moisture favors it. Sunlight and temperature over 30° C. kill it in a few hours, and its virulence is lost before its viability; clothing and bedding are dangerous fomites, while dry merchandise is not. Mild cheese and butter convey it, but water does not. First-class mail matter is generally safe. The colder the climate the more disinfection is needed, and sulphur is a better disinfectant than formaldehyde. A temperature of 70° C. is fatal to it. Bulletin No. 5 gives the results

of his studies of Danyz's virus, which is apparently identical with Löffler's *Bacillus typhi murium*. In this virus it was supposed there might be found a means of creating a fatal epidemic among rats, and so prevent their becoming a means of spreading the contagion of plague; but it has proved in his experiments to be but feeble, and while a virulent culture killed less than half the rats exposed, its strength rapidly died out, and any hope of causing extensive epidemics seems very doubtful.

The United States Commission in San Francisco reports that it discovered six cases in that city, three before death and three after. None of these cases had been reported to the Board of Health by the attending physicians, yet the bacilli were detected in the tissues in every case; inoculations established their identity. From Ann Arbor is reported a case of a worker in the Hygienic Laboratory who contracted plague while making Haffkin's vaccine and Lustig's serum, using a highly virulent culture from California. This case eventually recovered, Yersin's anti-pest serum being used. In twenty-four hours sixty cubic centimetres were injected intravenously and sixty cubic centimetres more subcutaneously.

**GEOGRAPHICAL DISTRIBUTION OF THE PLAGUE.**—During the past year the plague has appeared in many parts of the world, sometimes in violent outbreaks, as in India, where the mortality has reached ninety per cent. South Africa and Australia have had minor epidemics, and isolated cases have been reported in Turkey, Egypt, Mauritius, and San Francisco, where it has been confined to the Chinese, and also in several places in the British Isles, Glasgow having the most serious attack. Except in India and China, sanitary measures have seemed able to stamp out the disease. In India disinfection and inoculation have met with meagre success owing to race prejudices. In Australia these measures have succeeded better. House to house visitation and sanitation were rigidly carried out at Hong-Kong, Manila, and Honolulu. War against rats was waged in Australia, Japan, and a number of other places, and at English ports suspected vessels were ordered to be moored at a distance from the wharves and measures taken to prevent the egress of the rats while disinfection was employed.

**CAUSES OF PLAGUE.**—Edington reports his experiments made at Cape Town, demonstrating that at times rats are affected with a disease simulating plague, communicable to guinea-pigs but not to rabbits, even when the virus had passed through rabbits. Inoculation with this rat bacterium affords them no protection from the plague bacillus. On the other hand, Thompson, of Sydney, has noticed an epizootic disease among rats which preceded and was coextensive with the plague in man. This he believes undoubtedly to be plague. In Sydney the rats were

believed to be the propagating agents, while in Glasgow fomites and contact seemed responsible.

DIAGNOSIS AND TREATMENT OF PLAGUE.—Klein relies on cultures and sub-cultures aided by inoculation and the agglutination test; if these agree, he considers the diagnosis established. Since the discovery, by the German Commission to Bombay, of the bactericidal and agglutinating properties of a serum taken from cases that had recovered, workers have been endeavoring to perfect an emulsion of *Bacillus pestis* which should be homogeneous. Klein and Cairns, independently, succeeded by using .75 per cent. of saline solution. Cairns states that the reaction is not present in the acute stage prior to the seventh day, and Nyssokowitz and Zablotny confirm this, and find the reaction lasting until after the sixth week and gradually disappearing. In fatal cases it is not marked, while in severe cases that recovered it was positive, other organisms not interfering with the success of the test. Klein, on the contrary, mentions that the *Bacillus coli communis* or *Bacillus proteus* will prevent the reaction. Still further, Cairns states that serum taken from a healthy individual previously inoculated with Yersin's serum will not react, while Klein states that serum taken after Haffkin's prophylactic gives characteristic reaction.

Evidently many points regarding plague and its serum are yet undecided. From Sydney it is reported that Yersin-Roux's curative serum has been unsuccessful. In India a correspondent states that iodine terchloride ( $ICl_3$ ) is claimed by its discoverers as curing 58.91 per cent. of cases.

### MALARIA.

The question of the mode by which malaria reaches man seems at last to be settled, the mosquito being proved guilty. Other ways may exist, but they are of little moment. Yellow fever, also (and perhaps plague), are believed, on good grounds, to be spread by insects. Flies have been accused of conveying typhoid fever and cholera, and the attitude of the men of the future towards insect life will be distinctly different from that of the men of the past. We have, in fact just discovered The Great Insect Peril, and we know not what a day of science may bring forth. Insects have been long disregarded, or endured as necessary evils, kept at bay as unpleasant companions; but now, in their new *rôle*, they must be repressed and crushed out with a relentless hand. But surely, a world free from flies is something to look forward to. The early ages longed for it and found it not; as we know when we recall "Baal Zebub, Lord of Flies." Antiquity must have suffered, else why did it create out of its fertile imagination a God of Flies to whom it

could pray for relief, where we, in our day, look to science to save us? Then, too, there is that significant touch in the Chaldean Deluge tablets, making us and the old world akin, where the gods came about the sacrifice of the Chaldean Noah "like flies." We are but at the beginning of a war on insect life, and we will need all the skill and science we possess. The ornithologist must bring his knowledge and pit bird against other winged things; the entomologist must set insect to war against insect as the dragon-fly pursues the mosquito; bacterial disease must be let loose against them, and the chemist must lend us his lethal agents, solid, liquid, and gaseous; the mechanic must build bars, and the textile weaver his cunning nets, till we find our best weapons and how and where to use them. We must seek the *Anopheles claviger* abroad in the lonely swamps and the stagnant pool and hunt the sluggish *Cimex lectularius* and the fleet-footed flea at home. This is the task of the twentieth century. Marconi may invent wireless telegraphy, but give us mosquitoless nights. Dragons went with the days of fable; the lingering mammoth with prehistoric man. The carnivora and the wild things they preyed on have fled before the zeal of the hunter, and the birds have become a votive offering to feminine vanity, and now "sport" growing scarce we come to the little things that live and fly, and these little things are seen to be greater and more deadly than the mighty things that are gone, and we rather revere that cruel emperor of ancient Rome of whom it was said, when one asked who was with him, "not even a fly." Bugs are too little to shoot, and we must learn new ways for our hunting. Even in savage Africa and elsewhere they are training the natives to use gauze nettings, to fill up marshes, to cover with kerosine the breeding places of the deadly mosquito. Men are studying the ways of the insect. They find that sounds affects him, for he is something of a musician himself, and that he has also tastes and fancies in color. Nuttall,<sup>1</sup> relates his experience with regard to mosquitoes and colored fabrics. Breeding his mosquitoes in a tent closely shut in with gauze and containing a stone pool in which he could hatch them out, he studied their attitude towards cloths of different colors. Covering boxes with the cloths and observing their behavior, he found that certain colors attracted, while others repelled them. They settled on blues and grays if dark and avoided the lighter tints, while orange and yellow seemed actually to repel them. After experimenting for seventeen days he sums up his results in the following table:

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<sup>1</sup> British Medical Journal, September 14, 1901.

Color of Box.	Number of <i>Anopheles maculipennis</i> counted in each box during sev- enteen days.
Navy blue .....	108
Dark red.....	90
Brown (reddish).....	81
Scarlet.....	59
Black.....	49
Slate gray.....	31
Dark green (olive).....	24
Violet.....	18
Leaf-green.....	17
Blue.....	14
Pearl gray.....	9
Pale green.....	4
Light blue (forget-me-not).....	3
Ochre.....	2
White .....	2
Orange.....	1
Yellow .....	0
	512

DESTRUCTION OF MOSQUITOES.—Rosenau concluded,<sup>1</sup> after thorough investigation and careful experiment on the question of the destruction of mosquitoes, that formaldehyde acts feebly, requiring the same strength of gas and time of exposure as for the destruction of bacteria, with a very large volume, quickly liberated, in a room tightly closed and with no refuges left for the insects. Sulphur dioxide is unexcelled, acting when very dilute, penetrating fabrics surprisingly, and killing the insects even when hidden in thick folds of towelling. He thinks this the ideal disinfecting agent for malaria, yellow fever, and filaria. Professor Celli, who has been studying the effects of eucalyptus trees, believes that they do more harm than good, even protecting the mosquito.

REMEDIES FOR MALARIA.—These have been reinforced by methylene blue. A. Iwanoff reports<sup>2</sup> that this agent acts chiefly on the protoplasm, while quinine acts chiefly on the chromatin or pigment granules; hence, in early forms quinine is the best; while in adult forms of the parasite methylene blue is best. Five grains can be given three times a day. When tertian parasites were found it caused noticeable changes by the end of the second day and affected full grown forms, while the younger were unchanged, and in astivo-autumnal fever also the ring-formed parasite was unchanged.

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<sup>1</sup> Bulletin No. 6, Hygienic Laboratory, United States Marine Hospital Service.

<sup>2</sup> Deutsche med. Wochenschrift, May 2, 1901.



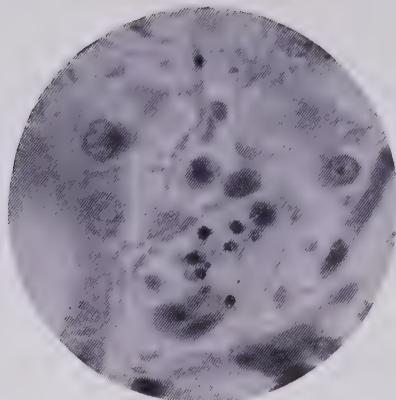


FIG. 8.—Pigment and body of parasites in red cell.



FIG. 9.—Malarial parasites in kidney

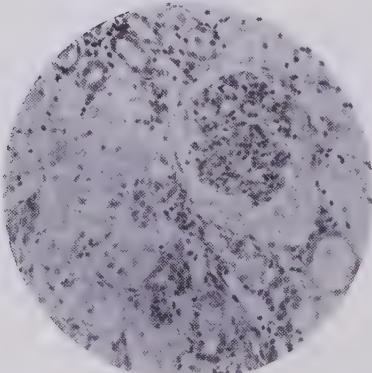


FIG. 10.—Degeneration and exudation in cortex in malarial nephritis.

MALARIAL NEPHRITIS.—Rempicci and Thayer have shown that albuminuria is frequently present in pernicious astivo-autumnal fever, and is found at times in milder tertian cases. Ewing found<sup>1</sup> clear evidence (Figs. 8, 9, 10) of large numbers of malarial parasites in the kidney itself. The clinical symptoms were bloody urine with partial suppression. He divides malarial renal lesions into three classes,—acute degenerative toxic; extreme acute degeneration, with focal necroses, hemorrhages and exudation of blood serum into the tubules; and a massing of parasites in the renal capillaries with extreme degeneration of parenchyma cells and multiple hemorrhages. The first type is probably the only one found in tertian infection in this latitude.

MALARIA AND CANCER.—F. Löffler<sup>2</sup> believes that malaria influences cancerous growths favorably. This was suggested in 1775 by Truka de Krzowitz. Malaria prevails most in the tropics, while carcinoma is most found in temperate regions. The beneficial action of the microcoecus of erysipelas is analogous to that claimed for malaria, but there are so many factors to be considered, civilization and its methods and customs differing so much from the mode of life in the tropics, that only prolonged study and unbiased observation can prove the truth or falsity of this supposition.

#### YELLOW FEVER.

The year 1901 is remarkable in the medical world for the clearing up of a problem the solution of which has heretofore baffled the best efforts of physicians and sanitarians. Although the mosquito origin of yellow fever was suggested by Finlay as early as 1881 and partially proved by him, the signal honor of conclusively demonstrating its propagation by mosquitoes has been reserved for a commission of the Medical Department of the United States Army, composed of Reed, Carroll, and Agramonte.

As the *Anopheles* are responsible for conveying the specific cause of malaria, so also are the *Culex* mosquitoes the great agents in transmitting the as yet unknown organism of yellow fever. Since the relation of the *Culex* to "Bronze John" has been established, the entomologist Theobald has placed the infection-bearing culex in a separate genus; the *Stegomyia*, specifically designated, *fasciatus* or *tarniata*. The *Stegomyia* are large, handsome insects, the characteristic markings being numerous white stripes on the thorax and abdomen with similar well-marked bands on the posterior extremities. After a meal of

<sup>1</sup> American Journal of the Medical Sciences, October, 1901.

<sup>2</sup> Deutsche med. Wochenschrift, October 17, 1901.

blood, in from two to thirty days, the impregnated female extrudes her eggs (at night) in pairs, with the occasional discharge of a fluid to assist in floating them. The eggs are black in color (.17 millimetre by .65 millimetre), averaging about fifty in number, oval, or cylindrical in shape, with one extremity slightly pointed. The stage of incubation occupies three days, the larval state seven, and the pupal period two, the insects arriving at maturity about the eighteenth day, with an average life in captivity of five weeks. While 77° F. appears to be the temperature most favorable to their evolution, the eggs are uninjured by drying or freezing; but 68° F. suspends their development. The insect soon dies if deprived of water and will not bite at a temperature below 32° F., thus explaining the oft-observed fact of the sudden cessation of an epidemic with the appearance of "frost."

The *Stegomyia* shows great predilection for its abiding place, and there are but few instances where they have been conveyed by ships to foreign shores. The distribution of these insects is quite extensive. Reed informs us that they have been found in all the large Cuban cities and in many of the smaller ones. Howard reports their existence in Jamaica and Nicaragua. Theobald has received specimens from Mediterranean cities. The Southern States show their presence, while Dunham has made collections of them in Brazil.

At least twelve days (on the average seventeen days) must elapse before the insect is capable of transferring the infection, a bite prior to this date conferring no immunity to subsequent infection. Carter presents numerous instances gathered from the Mississippi outbreak of 1898, where an interval of twelve days (shortest eleven days, fifteen hours) existed between the infecting and the secondary case. Guitérás is in accord with the commission, while Finlay still continues to believe that a contaminated mosquito is able to infect mechanically a non-immune during the first few days, provided the insect has not been allowed to feed, and also after the period of twelve days. This is borne out by the fact that yellow fever can be experimentally transmitted by the injection of infected blood, removed during the first or second day of the disease. An attack of fever produced by the contaminated mosquito confers immunity to infection of injected blood. The inoculation period based on thirteen cases is placed at from forty-one hours to five days and seventeen hours.

With all other sources of infection excluded, the commission succeeded at the experimental station of Quemados, Cuba, in infecting 85.71 per cent. of those individuals bitten by purposely contaminated mosquitoes. Guitérás, at Las Animas Hospital, Havana, met with less success, as he was able to infect but nineteen per cent. (eight in forty-

two), three cases ending fatally. He attributes his failure either to the doubtful nature of the infecting cases or to the fact that few germs were present at the time in their peripheral circulation, a view concurred in by Reed. As yet inoculation cannot be performed without great risk; but the mortality is much lower than when the disease is contracted in the usual manner, Gorgas and others believing that a non-immune is safer in contracting the disease where he can be watched carefully from the start. Guitérás<sup>1</sup> advises that for purposes of immunization but one mosquito should be employed at each inoculation and that a group of infected mosquitoes showing unusual virulence should be abandoned.

The commission believes that the *Stegomyia* is solely responsible for the propagation of the disease and that fomites may be disregarded as a cause. Finlay and Guitérás incline to this opinion, but Doty holds, notwithstanding that practical experience has shown the guiltlessness of fomites, to the possible existence of other and unknown means of transmission.

Acting on the belief of the commission that a locality can be said to be infected only when containing contaminated insects and that the spread of the disease can be controlled by measures directed to the destruction of the *Stegomyia* and the isolation of the sick, Gorgas<sup>2</sup> stopped the rigid quarantine of yellow fever patients and discontinued general and special disinfection. The houses of the patients were placarded and screened and a guard watched the sick-room sanitation. In Santiago des las Vegas the whole infected area was gone over and all mosquitoes killed. The work cost four thousand dollars, but was successful. Since September no cases of yellow fever have occurred in Havana; and the death-rate from all causes has fallen from 91.03 per cent. per thousand in 1898 to 33.67 in 1899, 24.40 in 1900, and estimated at 21 in 1901.

The United States Government has shown itself keenly alive to the importance of a better understanding of yellow fever, and has established an institute for its study and placed it under the direction and control of the United States Marine Hospital Corps. The work has been divided into four sections. The first has for its object the ascertaining of the cause of yellow fever; the second will deal with its history, statistics, and its relation to the slave-trade; the third will investigate its means of transmission; while the fourth will occupy itself with treatment and quarantine.

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<sup>1</sup> American Medicine, November 23, 1901.

<sup>2</sup> Philadelphia Medical Journal, January 4, 1902.

At the present time the treatment of yellow fever is purely symptomatic, Sternberg's alkali antiseptic method giving the best results. Neither the serum of Sanarelli nor that of Caldas has met with any degree of success.

**THE ORGANISM OF YELLOW FEVER.**—In the report of the Yellow Fever Commission of the Liverpool School of Tropical Medicine,<sup>1</sup> Durham and Myers give the results of their search for the cause of yellow fever. They found a fine, small bacillus in the organs of all fatal cases, in diameter like the influenza bacillus, and measuring four microns in length. The "pieces of mucus" usual in the stools were almost pure cultures of this bacillus, and generally but few other organisms were discovered in any of the organs, and if present were found in very small numbers. This same bacillus has probably been found and mentioned by Sternberg, Domingos Feire, and Carmona y Valle; it stains with difficulty, and culture in artificial media often fails. The most successful staining reagent is a carbo-fuchsin solution, diluted with a five-per-cent. solution of carbolic acid. After several hours of immersion in this fluid in the cold, the bacilli are differentiated by weak acetic acid. Durham and Myers conclude from their investigations that yellow fever is not due to the parasites of the nature of protozoa, for which they looked in vain.

#### GENERAL MEDICAL SUBJECTS.

**ACUTE PANCREATITIS.**—Acute pancreatitis is one of the newest disorders. The community have known all about their livers for years, but knowing not the pancreas, evidently because their doctors were also ignorant, it apparently gave them no trouble. In fact, it almost seemed the best illustration for the mind curists if they had only had mind enough to realize it. But all the time the pancreas was causing agonizing disease and sudden deaths, both masked under some other names while their real nature was unsuspected. At present we are accumulating, by autopsy and by experiment, data on which some rational theories can be founded as to the pancreas and its diseases. How much we suspect and how little we really know were shown in the case, which we give, of the death of the lamented President McKinley.

Mayo Robson<sup>2</sup> comments on the fact that only recently has it dawned upon the minds of clinical observers that whatever obstructs the common bile duct at its lower end must also of necessity lead to

<sup>1</sup> Johns Hopkins Hospital Bulletin, February, 1901.

<sup>2</sup> Philadelphia Medical Journal, June 7, 1901.

obstruction in the pancreatic duct. When the common bile duct is obstructed the objective signs of jaundice at once demonstrate the fact, but hitherto no pathognomonic sign has been discovered which will show conclusively that the pancreatic ducts are occluded, unless it be the extremely rapid loss of weight. When it is borne in mind that the pancreatic duct opens along with the common bile duct into the second part of the duodenum, it is not a matter for surprise that pancreatitis should be met with. The essential and immediate cause of the various forms of pancreatitis is bacterial infection, which has been positively proved both clinically in the human subject and experimentally in the lower animals. "The association of gall-stones with chronic pancreatitis was absolutely forced on my mind by the frequency with which I found inflammatory enlargements of the head of the pancreas when operating for gall-stones in the common duct." Taking up the subject of fat necrosis Robson states that this condition is commonly found in association with pancreatitis and the relationship between the two conditions has given rise to much speculation. Hemorrhage in pancreatic diseases is dwelt upon, and it is mentioned that death from collapse may occur either immediately or some hours after spontaneous hemorrhage. Several illustrative cases are cited, together with the symptoms and results, the following conclusions being reached: (1) that in certain diseases of the pancreas there is a general hemorrhagic tendency, which is much intensified by the presence of jaundice; (2) that hemorrhage may apparently occur in the pancreas, unassociated with inflammation or with jaundice or with a general hemorrhagic tendency; (3) that both acute and chronic pancreatitis can and do frequently occur without hemorrhages, and (4) that some cases of pancreatitis are associated with local hemorrhage.

**EXPERIMENTAL PANCREATITIS.**—Flexner and Pearce,<sup>1</sup> as the result of their studies of experimental pancreatitis in dogs, come to the following conclusions:

"1. Pancreatitis follows upon a variety of insults to the pancreas, and is capable of developing with great rapidity. The introduction of such a foreign body as artificial gastric juice into the pancreas gives rise to degeneration, hemorrhage, and emigration of leucocytes within the brief space of one to two hours.

"2. Chronic inflammations (scleroses) of the pancreas may result from the more remote effects of agents which, acting with greater intensity, produce fatal acute inflammations.

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<sup>1</sup> University of Pennsylvania Medical Bulletin, August, 1901.

"3. Perversion of normal secretions, whereby they enter the pancreas, as illustrated by the effects of gastric juice and bile, are efficient causes of pancreatitis.

"4. The presence of blood alone in the tissues of the pancreas does not set up an acute inflammation; the tendency is for the rapid production of a chronic proliferative inter- and intra-acinar pancreatitis.

"5. The effects of blood are not produced by blood-serum separated from the corpuscular elements.

"6. The spleen has no influence upon the development of pancreatitis and the production of fat-necrosis.

"7. Fat necroses attend all forms of pancreatitis, and are more numerous and more widespread, the more acutely the pancreatic lesions develop. They may appear as early as eight hours after injury to the pancreas.

"8. Glycosuria appears quickly after injury to the pancreas; it may persist for several days and then disappear, although the pancreas has suffered permanent partial injury."

THE TREATMENT OF PURPURA HEMORRHAGICA BY THE INTRAVENOUS INJECTION OF BICHLORIDE OF MERCURY.—Lusignoli<sup>1</sup> regards this disease as a bacterial infection, and is induced by the success attending the intravenous injection of quinine in pernicious malaria, and also of bichloride of mercury in syphilis and in some cases of erysipelas, to give intravenous injections of bichloride of mercury in this disease also. The injections are made once daily until the condition of the patient is materially improved. They are made into the basilic, cephalic, median basilic, or median cephalic vein, according as one or the other happens to be the most prominent. From one to four milligrammes are given at each injection. The injections are made with an "ordinary Pravaz syringe." He cites in detail only one case in which this treatment was used. The patient had numerous skin ecchymoses and there had been several severe attacks of haematemesis. The patient recovered after several injections. No mention is made of a bacteriological examination of the blood. In another case he was apparently not so successful, for he merely states that the patient came under observation too late for the treatment to be successful. In two other cases the results obtained were excellent. Lusignoli also reports the cure of a case of peliosis rheumatica and of a case of scorbutus by the same line of treatment.

TREATMENT OF ACUTE ARTICULAR RHEUMATISM BY MASSAGE WITH

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<sup>1</sup> Archives générales de médecine, January, 1901.

PETROLEUM.—Sarafidis<sup>1</sup> reports that he has been able to cure articular rheumatism in fifty cases by massage for ten minutes daily with petroleum. The strokes are made in the direction of the venous circulation. If skin eruptions appear, the treatment is discontinued for a few days.

INFANTILE SCURVY.—Griffith<sup>2</sup> calls attention to the fact that although the cause of scurvy is clearly dietetic, yet no one dietetic fault can be alone held responsible. Starr<sup>3</sup> classes the faulty foods as follows in the order of their potency:

1. The different proprietary infants' foods administered without the addition of cow's milk.
2. Proprietary foods employed with the addition of insufficient quantities of cow's milk.
3. Oatmeal- or wheat-gruel, barley, and other farinaceous foods administered with water alone or with water and insufficient cow's milk.
4. Condensed milk and water.
5. Sterilized milk. Properly modified milk mixtures subjected to a temperature of 212° F. from thirty minutes to an hour or more.
6. Too dilute milk-and-cream mixtures. Laboratory mixtures with too low albuminoid percentage.

The essential treatment of infantile scurvy is the employment of a food composed of cow's milk, cream, water, and milk-sugar, properly proportioned to the age of the infant, and given, so far as the cream and milk are concerned, in the natural, fresh state; *i.e.*, not passed through the separator and not sterilized.

Pasteurization and predigestion at a temperature of 115° F. are admissible in certain cases, but should never be employed when the cream and milk are carefully handled at the dairy and can be kept clean and sweet, and when the infant's digestion is even moderately active.

The juice of fresh ripe fruit—orange-juice especially—is a useful addition to the diet, and, when it can be taken without producing diarrhoea, is an efficient aid to rapid recovery.

If orange-juice cannot be obtained, or should it disagree, good substitutes are two to four tablespoonfuls of scraped ripe apple (raw), two tablespoonfuls of fresh grape-juice, or six solid grapes from which the skins and seeds have been removed.

In addition to the alteration of the diet very little treatment is necessary.

#### CHILD MORTALITY IN CHICAGO AND THE MILK SUPPLY.—The

<sup>1</sup> American Medicine, November 2, 1901.

<sup>2</sup> New York Medical Journal, February 23, 1901.

<sup>3</sup> Philadelphia Medical Journal.

*Monthly Bulletin* for April, 1901, gives the statistics of municipal supervision of the milk supply of Chicago which was established by a city ordinance enacted October 21, 1892. This supervision was transferred to the Department of Health in September, 1893. The accompanying graphic exhibit shows: (1) the improvement in the quality of the milk between 1893 and 1900; (2) the decrease in the proportion of child mortality to total mortality in the two seven-year periods and after 1893; (3) the decrease in this mortality in the under-one-year of age or *nursing* period; and (4) the decrease in the between-one-and-five-year or *milk-feeding* period.

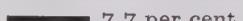
1. PROPORTION OF SAMPLES OF MILK BELOW GRADE.

YEARS:

1893



1900



Improvement in 1900.....83 per cent.

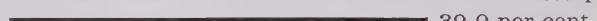
2. PROPORTION OF DEATHS UNDER FIVE YEARS OF AGE TO TOTAL DEATHS.

7-YEAR PERIODS:

1886-1892



1894-1900



Reduction in second 7-year period .....16.9 per cent.

3. PROPORTION OF DEATHS UNDER ONE YEAR OF AGE TO TOTAL DEATHS.

1886-1892



1894-1900



Reduction in second nursing period.....13.3 per cent.

4. PROPORTION OF DEATHS BETWEEN ONE AND FIVE YEARS TO TOTAL DEATHS.

1886-1892



1894-1900



Reduction in second milk-feeding period..22.5 per cent.

Comparing the two seven-year periods—divided by the year 1893, when milk supervision was transferred to the Department—the following figures make clear the great reduction in child mortality in the latter of the two periods:

	First Period, 1886-1892. Before milk supervision.	Second Period, 1894-1900. During milk supervision.
Total deaths at all ages.....	137,455	166,414
Total deaths under five years of age.....	64,485	65,028
Proportion of deaths under five to total deaths..	46.91 per cent.	39.07 per cent.
Reduction in second period.....	16.9 per cent.	
Total deaths under one year of age.....	40,642	42,675
Proportion of deaths under one to total deaths ..	29.56 per cent.	25.64 per cent.
Reduction in second period.....	13.3 per cent.	
Total deaths one to five years of age.....	23,833	22,351
Proportion of one to five year deaths to total deaths.....	17.34 per cent.	13.43 per cent.
Reduction in second period.....	22.5 per cent.	

It will be seen from the above figures that, had the same proportion of child mortality obtained in the seven years under milk supervision that did in the seven years before milk supervision, there would have been 78,048 deaths under five years of age out of the total 166,414 total deaths of the second period, instead of the 65,028 that did occur in the milk supervision period—a saving of 13,020 children's lives in the last seven years.

In Berlin, under scientific care in distribution of milk, the death rate among infants in the ten years, 1890 to 1899, fell from 27.1 in every one hundred living-born children to 23.4, a reduction of 13.6 per cent., being very close to the reduction effected in Chicago.

**THE NIPPLE OF THE NURSING-BOTTLE.**—Schmidt,<sup>1</sup> recognizing the defects of the nipple of the ordinary nursing-bottle, has devised a nipple which consists of the ordinary finger form, containing slits, instead of holes, in the end, which have a valve-like action, and prevent the ingress of air; and on its sides an opening that can be regulated by a screw-valve to allow air to get into the bottle. The extent to which this is opened regulates the amount of the flow and the effort required to obtain the milk.

**THE FOURTH DISEASE.**—To this disease, so poorly named by Dukes, who has been the most active in its study, considerable attention has been paid during the year by various observers. Simpson<sup>2</sup> reports his experience with an epidemic of an exanthematous disease which was thought at first to be rubella, and afterwards mild scarlet fever. When, however, an attendant who had had scarlet fever developed this disease, the diagnosis became doubtful. The author suggests that this may have been an epidemic of Fourth disease. The status of this disease has yet to be definitely settled.

**CHAPPA.**—There are reported in the *Journal of Tropical Medicine*, by Ed. H. Reed, four cases of a disease not previously described in medical works. It is called by the Ponos of the western district of Goyos, "chappa." It begins with severe pains in the muscles, limbs, and joints, which, after a few months, decrease, giving place to tumefaction. In different portions of the body nodules appear, without the formation of abscesses. Either ulceration of the skin covering the nodule or resolution may occur. The nodules, circular or oval in shape, are usually multiple, about the size of a pigeon's egg. Gradually the bones and joints are similarly attacked, with at times complete obliteration of the parts involved. Reed believes that neither

<sup>1</sup> *Münchener medicinische Wochenschrift*, January 1, 1901.

<sup>2</sup> *Archives of Pediatrics*, September, 1901.

syphilis nor tuberculosis is the causative factor. No form of treatment has given satisfactory results.

**SKIN-STRETCHING.**—George A. Zeller, Captain and Assistant Surgeon, United States Volunteers, reports the practice of skin-stretching among Bicols, Philippine Islands, known as Tangkong. It is quite universal, especially among the poor. The elevations on the back of the neck are the result of repeated stretching (Fig. 11). When the neck becomes sore from repeated stretching, a strong salt solution is applied and the operation is repeated. The operation is usually performed by the parabolong, or native medicine man; but any one can do it. It is used as a general cure-all; but its greatest virtue lies in the cure of headache.

**ADRENALIN IN MORPHINE AND OPIUM POISONING AND ALLIED CONDITIONS.**—The fact that the active principle of adrenal extract when given by the stomach in sufficient quantity is a decided circulatory, respiratory, and general metabolic stimulant, has led Reichert to experiment with its use in cases of opium poisoning with favorable results. He has found<sup>1</sup> that upon dogs this drug has prompt and positive action, sufficient to justify the belief that it will be found of value in opium and morphine poisoning, in failure of the circulation, in the prevention of collapse in anaesthesia, and in allied conditions. Reichert recommends that, if it is given by the stomach in morphinized individuals, it should be administered with alcohol in some form so as to increase the rapidity of absorption.

**THE PRESENT POSITION OF THE BACTERIOLOGY OF RHEUMATIC FEVER.**—Poynton and Paine,<sup>2</sup> in investigating the etiology of rheumatic fever, used only cases of rheumatic fever in childhood. In this way they have materially lessened the possibility of mistaking cases of arthritis deformans and gout for rheumatism. They classify the views upon the bacteriology of rheumatic fever under five groups:

1. Rheumatic fever is the result of an infection with a diplococcus. The researches of von Leyden, Triboulet, Dana, Appert, Wassermann and Malakoff, and Fitz Meyer, as well as their own, have a special bearing on this view.

2. It is the result of an infection with a specific anaerobic bacillus. Achalmc, Thiroloix, and several French observers believe that the disease is due to such a bacillus, which is of large size and remarkably variable in its morphological characters. These investigators claim

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<sup>1</sup> University of Pennsylvania Medical Bulletin, April, 1901.

<sup>2</sup> British Medical Journal, September 21, 1901.



FIG. 11.—Results of skin-stretching among Filipinos.



to have found the organism constantly and to have produced the disease experimentally in rabbits.

3. Rheumatic fever is not due to any particular micro-organism, but is a special reaction to varied infections. The writers do not think this view is entitled to more than passing mention.

4. Simple uncomplicated rheumatism, which reacts to salicylates, is due to some unknown virus, and the complications are the results of secondary infections, usually with cocci. The writers say that if one takes the rheumatic fever of childhood as the type, it is difficult to say which lesions are to be considered as complications and which as a part of the disease itself. They are of the opinion that the so-called complications are due to the same organism as are the joint manifestations.

5. Rheumatism owes its origin to staphylococcal or streptococcal infection, that it is, in fact, an attenuated pyæmia due to pyogenic cocci. This view is advanced and strongly supported by Gustav Singer.

They have isolated a diplococcus in eighteen cases of rheumatic fever, and have named it "diplococcus rheumaticus." They trust that other investigators will be able to support their view that there is a specific organism, for if it be conclusively proven that there is such an organism, it may then be possible to isolate a specific toxin and eventually to manufacture a curative antitoxin.

Predtetschensky, in a bacteriological study of acute articular rheumatism, was unable to find Achalme's bacillus, but he found an organism closely resembling Wassermann's streptococcus which, when inoculated into animals, produced a disease presenting the clinical picture of acute articular rheumatism, including in one case a well-developed endocarditis.<sup>1</sup> Menzer, in the *Deutsche medicinische Wochenschrift*, February 14, 1901, states that the discovery of streptococci in rheumatism is not especially significant, for they can be found in almost any infectious disease. A number of forms of bacteria have been reported, and it is possible that some one of these changes will be shown to be the constant exciting cause of rheumatism. Newsholme believes that rheumatic fever is a soil disease due to a saprophytic soil organism, and that inoculation may be brought about by domestic vermin, or it may be conveyed by milk and other food.<sup>2</sup>

ARSENICAL NEURITIS.—Arsenical neuritis, as described in its recent occurrence in England, is a subject of great interest and suggests some side thoughts. If beer in America contains (as it does) arsenical

<sup>1</sup> Vrach, June 16, 1901.

<sup>2</sup> The Practitioner, January, 1901.

glucose, why have we no such epidemic of neuritis? Or, have we had it unrecognized? For it may be recalled that beginning about 1891 up to 1899, neuritis has been unusually prevalent, being most often described as influenzal in origin. And if cheap glucose generally contains arsenic in dangerous quantity, is there nothing in which we can find it but beer? Now neuritis has been most commonly met with among women, and those, as a rule, non-drinkers; but they are candy-eaters, and it would be of interest to know how much glucose is used in the manufacture of candy. It is also not yet proved that the arsenic rather than some as yet undetected germ or toxin caused the outbreak in England.

The medical profession of England have been obliged during the past eighteen months to treat an extensive epidemic of arsenical neuritis, occurring principally in the vicinity of Manchester and Liverpool. Sir T. Lauder-Brunton, in the *British Medical Journal* for May 4, 1901, takes up the discussion of the action of arsenic, and decides that the symptoms of this epidemic were identical with those occurring in chronic arsenic poisoning produced in other ways. The fact that sufficient arsenic was discovered in different brands of beer to produce arsenical poisoning, aroused the medical profession to notify the health officers of the various cities interested, and to give the name of the establishments from which the beer was purchased, and the name of the patients. Raw<sup>1</sup> states that the arsenic was undoubtedly contained in the sulphuric acid used in making glucose, which is used by the brewers. Raw states that he thinks that the epidemic is now subsiding. Personally, he treated seventy cases, among which there was only one death. Sensory disorders were the most prominent, such as numbness, tingling, pain, and erythromelalgia. He could find no distinctive impairment of sensation. He found that ataxia was not present, and the knee-jerk usually normal.

Delépine, in the *British Medical Journal* for January 12, 1901, reports that he does not believe that the mere detection of traces of arsenic is sufficient to prove that a beer is actually dangerous to health. He bases this upon the fact that arsenic is one of the most widely distributed substances, frequently associated with sulphur, in various mineral products. Delépine suggests that the analysis of the beer to show that it was harmless should report less than 0.8 of a grain of arsenious acid to the gallon, and he believes that it would be well to establish a law prohibiting the use of malt substitutes, for he found no distinct trace of arsenic in the beer of Bavaria, where the use of

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<sup>1</sup> *British Medical Journal*, January 5, 1901.

such substances is strictly prohibited. On examining the sulphuric acid used in the factory from which the arsenical glucose came, Delépine found that it contained so much arsenic that a deposit of arsenious acid was found in the bottom of the bottle containing the acid which had been sent for investigation.

**TETANUS.**—The following abstracts will be read with added interest in connection with the recent cases of tetanus in St. Louis and Camden. Some disappointment has been often expressed by members of the medical profession, and much more by the public, over the failure of antitetanic serum to avert the fatal issue in these cases. A reading of the extracts given below and published in February, 1901, will show that the result was what might naturally have been expected. The serum is of no use unless given within thirty hours of the onset, and cannot be expected to do more than neutralize the toxins still in circulation in the blood.

**TREATMENT OF TETANUS.**—Wilms<sup>1</sup> wishes to emphasize that, even with the strictest adherence to Behring's directions, the serum treatment should be commenced within thirty hours of the onset, and no fewer than one hundred units should be injected at a time. Acute tetanus does not seem to be helped at all by tetanus antitoxin. He notes two cases of chronic tetanus in which recovery took place independently, he thinks, of the injections. Rostowtser<sup>2</sup> thinks the frequent disappointments following the administration of antitetanic serum are to be attributed to the fact that the tetanus-toxins combine chemically with the nerve-cells, and the antitoxin neutralizes only those toxins which are circulating freely in the blood. By the time a patient comes for treatment a considerable amount of toxin has already entered into combination with the nerve-cells, and is therefore beyond reach. Antitetanic serum is, therefore, a prophylactic and not a curative agent.

Bissell<sup>3</sup> thinks that the modern treatment of tetanus resolves itself into two classes: (1) preventive treatment, by means of vaccination, and (2) treatment after the disease is present. Preventive treatment should be carried on wherever there are cases in the hospital or in the neighborhood of an operation; where there is a history of exposure, however remote, in a given case for operation; or in an accidental wound; in those districts where tetanus is common; or in injuries where the wound has been contaminated with earth in any way. The injection is harmless if it be a definite and well-prepared

<sup>1</sup> Münchener medicinische Wochenschrift, February 5, 1901.

<sup>2</sup> Vrach, February 24, 1901.

<sup>3</sup> Philadelphia Medical Journal, February 16, 1901.

antitoxin, and the probability of its success is great. Tizzoni reports two cases injected with a virulent tetanus culture. Both were students in his laboratory. Antitoxin was used subcutaneously in one case on the third day following injection, and the patient had very slight symptoms and recovered. The other case was injected within twenty-four hours; at the end of thirteen days he had slight convulsions of the muscles of the extremities, and recovered without further symptoms.

When tetanus is present, it can be treated in three ways: by medicines, usually in the form of sedatives; by injections of antitoxin; and by a combination of the two methods. A fourth way is by the injection of some antiseptic solutions, such as bichloride of mercury or carbolic acid, or by extractives, such as brain-emulsion; these substances, however, have not proved satisfactory, and in several recorded cases this method has done positive harm.

Acting on the knowledge that the tetanus germ cannot grow or even sporulate at a moderately low temperature ( $55^{\circ}$  F.), Dr. Joseph G. Rogers<sup>1</sup> proposes to use local cold applications as an adjunct to other methods in treating traumatic tetanus. He would secure prompt local injection, deep in and around the wound, of a twenty-per-cent. carbolic solution of glycerin with two per cent. of hydrochloric acid added; and would reduce the local temperature by the application of ice water or ice-bags to the part. He calls attention to two cases of pronounced traumatic tetanus, with spasms involving all the trunk and limbs, in which cold applications appeared to play an important part. In one case relief was experienced in a few hours, and the symptoms entirely disappeared on the fifth day; the patient then removed the ice-bags and a relapse ensued, which was treated as before and followed by complete recovery. In neither case were drugs or other local applications employed or apparently required.

THE TREATMENT OF AORTIC ANEURISM BY MEANS OF SILVER WIRE AND ELECTRICITY.—Hall and Freeman<sup>2</sup> report two cases of aortic aneurism treated by these means, from the study of which, and the general literature upon the subject, they come to the following conclusions:

1. Considering the inefficiency of medical treatment, and the comparative efficiency of the use of silver wire and electricity, it is probably better to proceed to the latter at once without wasting valuable time upon the former. This seems all the more desirable when we

<sup>1</sup> Indiana Medical Journal, October, 1901.

<sup>2</sup> American Journal of the Medical Sciences, December, 1901.

consider that wiring is not a dangerous process, and that it is in the early stages of an aneurism, when the sac is still firm and the patient is in good condition, that the best prospect of cure exists.

2. Soft, undrawn, unalloyed silver wire devoid of spring—wire just as it comes from the shop—is preferable to the hard, highly drawn wire alloyed with copper and full of spring. It is hardly necessary to previously coil the wire.

3. It is still an open question as to which is preferable,—a large amount of wire or a small amount, with the theoretical advantages in favor of the former.

4. A strong electric current is apparently preferable to a weak one.

5. The cannula through which the wire is introduced should be inserted just within the sac, and no further.

6. There is little if any danger of bursting the aneurism from increase of pressure due to coagulation in a portion of the sac only.

Willard,<sup>1</sup> in the report of a case similarly treated, formulates the following belief as the result of his experience: The size of the wire should be thoroughly graduated to the calibre of the needle, which latter should be tested to ascertain the smoothness of its bore, as it is essential that the wire should slip easily through it. No practical difference between silver, gold, and platinum wire is personally seen. Sizes No. 27 to No. 30 are probably about the best diameter. Finney uses silver alloyed with copper (seventy-five copper to one thousand). This, when drawn down from No. 8 to No. 27, makes a close coil, is very pliable, and corrodes moderately with galvanism. Stewart found that iron wire was undesirable, for the reason that the passage of the current rapidly decomposed it and liberated iron chloride and oxide in such quantities as to be dangerous if washed into the vessels with a probability of causing thrombi.

The amount of wire should be regulated by the size of the aneurism, its object being to form a skeleton for a clot; the amount should be so regulated that it will fully reach all portions of the sac, for which reason it should be previously wound so as to coil and snarl in different directions. The wire for a large aneurism can be wound upon a sterilized rolled towel, so as to make large spirals in the sac; for a smaller sac, it should be wound upon a glass or spool; in either case it should be carefully arranged and prepared so that there will be no delay or kinking during the process of feeding the wire in through the cannula. If the wire kinks, other needles may be inserted at different points of the aneurism, all the wires being attached to the positive

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<sup>1</sup> University of Pennsylvania Medical Bulletin, September, 1901.

current. The arrangement of the coils can be well observed by feeding the wire into a glass flask. If the wire is properly wound before operation, it is very improbable that the initial point will strike the opposite wall. If too large a quantity is used, pressure upon the sac from within might cause ulceration and rupture, and might also interfere with contraction of the sac; moreover, if coils lie against the wall and the current is too strong, the sac may be burned. Moore used as high as one hundred and eight feet, and Abbe one hundred and fifty; Roosevelt introduced two hundred and twenty-five feet of steel piano-wire, applying a galvanic current of twenty-five milliampères for thirty minutes. Probably five to twenty feet would be the proper amount.

It is very important that the tissues be protected from the galvanism. For insulation of the needle, best French lacquer or varnish, set by heat, seems best. Lacquer will not stand boiling nor soaking in a carbolic solution, but it can be thoroughly sterilized by dry heat carried up to 300°, then wrapped in a sterile towel. A long veterinary hypodermic is better than a trocar and a cannula, even of the same size, since the wire can be inserted half-way into the needle before the puncture is made, and assists in controlling primary hemorrhage when the needle is inserted.

There is always risk that the wire may enter the aorta, as has happened in several cases, and minute or larger clots may be washed off and form emboli.

Ten patients have been positively benefited, one is uncertain, and, while the remainder died at various periods within a year, yet nearly all of those that survived the immediate effects of the operation were rendered decidedly more comfortable.

This method, therefore, of dealing with a most serious condition seems to offer a more reasonable hope of success than any other plan at present discovered.

**BLOOD-PRESSURE IN HEALTH AND DISEASE.**—This has been made the subject of study by Carter.<sup>1</sup> He gives a full description of the sphygmometer and records the results of his observations with it. These are of great interest, but we can give but a few here. The average normal arterial pressure is higher in males than females. In acute nephritis the blood-pressure varies directly with the amount of albumin in the urine; acute parenchymatous nephritis complicating an acute infectious disease causes little increase. The average mean arterial pressure in chronic nephritis is much higher than in acute nephritis. The most satisfactory drug for lowering blood-pressure, what-

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<sup>1</sup> American Journal of the Medical Sciences, December, 1901.

ever its cause, is sodium nitrite, two to three grains every two to four hours; it acts in twenty-five minutes, and the effects last less than two hours. When symptoms of uræmia are present, phlebotomy, five to eight ounces, followed by saline infusion and sodium nitrite, almost always cause improvement, in anaemia pressure is below normal.

Dr. Hobart A. Hare, in a paper read before the Association of American Physicians, April 30, 1901, states that in patients in the early stage of pulmonary tuberculosis or in the anaemia of influenza he has noticed a vibrating systolic sound on a level with the nipple; in area, from one inch to the right to one inch to the left of the sternum; not a hæmic but a vibratory murmur, accentuated by nervousness, but not by exercise; dry, like pericardial friction, resembling the word "ching." He believes it due to vibration of the chordæ tendinæ from deficient contraction of the papillary muscles. Osler, in the discussion, stated that in weak hearts he had heard, at the apex, sounds simulating pericardial friction but more grating, and also near the sternum a "crunching" sound; these are perhaps similar to the sound described by Dr. Hare.

**PULSATION IN AORTIC INSUFFICIENCY.**—Schlesinger has studied an inward movement, following the beat of the carotid, in the tonsils and pharynx, in aortic insufficiency. In other cases he has observed a rhythmic swelling extending like a wave over the softer parts, while the tongue grew visibly thicker in systole and thinner in diastole.

Runeberg<sup>1</sup> calls attention to auscultatory percussion. The examiner places his stethoscope over the organ to be examined and percusses gently. Transsonance will be clear over the organ, but beyond its limits changes or disappears; we can thus outline organs. This method has been thoroughly exploited in connection with the recent stethoscopes of the phonendoscope class, with a chest-piece which greatly augments sound.

#### PRESENT STATUS OF X-RAYS.

Enthusiasm always attends any novel advance in medicine, giving place to general scepticism, and finally to a true estimate of its value. The X-rays, at first, were to take the place of surgical diagnosis. As an exhibition of secondary disappointment we may cite the report of the committee of the American Surgical Association on the Medico-Legal Relations of the X-rays, in 1900. White, also, in the *Post-Graduate* for January, 1901, enumerates what he believes to be the misleading aspects of this treatment. His conclusions are that every case of

<sup>1</sup> Zeitschrift für klinische Medicin.

fracture does not require the X-rays; when in doubt, use them, always remembering that fractures have escaped notice or have (apparently) been seen where they did not exist. In the base of the skull, the spine, and the pelvis results have been unsatisfactory. In deformity, skiagraphs alone are useless and misleading; satisfactory callus cannot be discriminated in recent cases, nor fibrous union from very recent callus. X-ray burns are believed to be easily preventable, while there is a possible idiosyncrasy to be reckoned with. The greatest value of X-rays is in recognizing foreign bodies, though there is a possible source of error as to exact location. The X-rays are destined to be a factor in medicolegal cases, and while the management of the apparatus and general technic should be in the hands of experts, the surgeon should be familiar with skiagraphs and a judge of their relative value.

On the other hand, its advocates are trying to put its use on a firm basis. Monell, chairman of the Committee on Standards of the Röntgen Society of America, has sent out a series of queries to elicit answers which may secure accuracy and give legal value to the X-rays. These are technical, relate to apparatus and methods, and cover a multitude of points of great value.

Leonard<sup>1</sup> concludes that fractures formerly considered rare are proved by the X-rays to exist in much greater numbers than suspected; that often the "traumatic arthritis" or bad sprain results from undetected fracture; that the Röntgen rays find multiple fracture where only a simple one was suspected; that by them we know the exact line of fracture and can guard against overlapping and shortening, angular deformities, and rotations, while in joint fractures we may find malposition of fragments or interfering callus formation; and all this without manipulation. Coaptation becomes more certain, and cases impossible to reduce without operation are diagnosed easily, while the setting is done with more accuracy.

TREATMENT OF INOPERABLE CANCER.—Cooper<sup>2</sup> commends the use of Röntgen rays in the treatment of inoperable rodent ulcer and superficial malignant ulceration in other parts.

TURCK'S GYROMELE AND THE X-RAYS IN DIAGNOSIS OF DISEASES OF THE STOMACCI.—Rudis-Jicinsky<sup>3</sup> points out that it is not necessary to fill the stomach with albumin or bismuth nitrate to successfully diagnose a dilatation or any obstruction existing at the pylorus. With the introduction of Turck's gyromele, or the revolving sound,—a flexi-

<sup>1</sup> Medical News, February 23, 1901.

<sup>2</sup> Lancet, October 12, 1901.

<sup>3</sup> American X-Ray Journal, November, 1901.

ble wire cable,—with a sponge attached, and the observation of this instrument with the X-rays and fluoroscope, one can easily follow the cable along the oesophagus and around the walls of the stomach. This will indicate the character of the stomach walls, show any thickening, and determine distensibility and flexibility. The introduction of the gyromele, examination by the fluoroscope, and making of a skiagraph will not consume more than fifteen minutes, and the work is not only rapid but correct. It is well to cover the umbilicus with a metallic button, which will appear on the skiagraph, to serve as a guide for measurements.

**THE X-RAYS IN MEDICINE.**—Capo<sup>1</sup> reports on the use of X-rays to demonstrate glandular tuberculosis. The tachycardia important in the early diagnosis of tuberculosis is not rhythmical, while the excursions of the diaphragm are visible and give valuable information. He notes also modifications in the position of the clavicle and scapula, the peculiar shape of the intercostal spaces, and the small size of the tuberculous heart. Eisendrath<sup>2</sup> reports results not wholly gratifying in the diagnosis of pulmonary abscess, gangrene, and bronchiectasis following pneumonia, as a shadow may be given some distance from the actual focus. Tuffier secured five pictures out of eight cases which gave a distinct shadow at the seat of the focus. Bonnet-Leon, in the same issue, reports more than six hundred observations in which he used the fluorescent screen, securing an exact diagnosis of tuberculosis in ninety-eight per cent. of his cases, even at the outset of the disease.

Moullin<sup>3</sup> asserts that the X-rays are conclusive for ordinary cases of calculi, giving definite information as to size and location, and whether single or multiple. Exceptions are found in abnormally stout abdomens or in lumbo-dorsal curvature displacing and hiding the kidney. A negative result after a second examination under varying conditions he considers a very reliable indication of the absence of calculus. He puts a firm bandage around the abdomen to prevent the act of respiration moving the kidneys.

Morris<sup>4</sup> finds that recent cases of lupus not previously treated yield satisfactory results under the X-rays, while Schiff and Freund consider this treatment indicated in lupus vulgaris, mycosis of the skin, sycosis favus, acne, and lupus erythematosus.

Towle warns against the medical use of X-rays for several reasons, prominent among which may be mentioned the lack of knowledge of

<sup>1</sup> Boston Med. and Surg. Journal, August 29, 1901.

<sup>2</sup> Philadelphia Med. Journal, November 9, 1901.

<sup>3</sup> Lancet, January 19, 1901.

<sup>4</sup> New York Med. Journal, October 19, 1901.

their nature, the danger of effects histologically similar to inflammation, the lack of proof that they have any bactericidal power, the extraordinary length of time required before permanent results are apparent, and that lupus and other diseases may be superficially healed over.<sup>1</sup>

A NEW METHOD OF SKIAGRAPHIC DIAGNOSIS IN RENAL AND URETERAL DISEASE.—G. Kolischer and L. E. Schmidt give details of a method by which the ureters can be satisfactorily skia graphed by the introduction of smooth, highly polished, flexible lead sounds blended with antimony. The Brenner or Casper cystoscope is used. After much experimental work upon the cadaver, they assert that injury to the parts is reduced to a minimum, and that it is possible to determine the course of the ureters and the location of the renal pelves, to diagnose dilatation, and to show the situation of renal calculi. The investigators assert that gall-stones and renal calculi can be differentiated, as also dislocated and enlarged kidneys from non-renal neoplasms.

#### MEDICAL LEGISLATION.

Stricter legislation on medical subjects may be confidently looked for in the future. Paternalism has not overlooked the added power that it may gain from associating with itself the fiat of the physician. We should be more careful not to put forth unconsidered and biased statements, and should condemn as individuals and through our medical journals and societies any unwarranted encroachments in the name of medicine upon individual liberty. Not only are municipal governments and State Boards of Health becoming more active, but Legislatures (in which the doctor is rarely represented) are passing or striving to pass bills often appalling in their utter want of the simplest medical knowledge. Minnesota prohibits marriage unless a satisfactory certificate of a physician is presented by both parties. (This law is a laudable effort to prevent the marriage of those who have been subject to "insanity, epilepsy, or loathsome disease.") Pennsylvania now strictly prohibits the marriage of cousins. This is more questionable, and it would seem to have been better to make such parties desirous of marrying submit their family record on both sides to competent medical authority; since, while the marriage of cousins may entail upon their offspring a double chance of inheriting family failings, it should not be forgotten that it may also intensify in such offspring any good traits in their families; and many brilliant men and women whom the world could have hardly spared have been the children

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<sup>1</sup> Boston Medical and Surgical Journal, April 19, 1901.

of such unions. Ohio has regulated the prophylaxis of ophthalmia neonatorum, following New York, Maine, Minnesota, and other States. The Arkansas Legislature has had under consideration a bill prohibiting the sale of potassium bitartrate. Stewart (*Journal of the American Medical Association*, April 27, 1901) recommends the establishment of a National Bureau of Materia Medica for the following purposes: (1) To establish standards of materia medica preparations. (2) The Bureau should act as a medium of communication between manufacturers and those engaged in marketing products and in scientific work in laboratories and hospitals. (3) To gather knowledge of materia medica products, to establish a system of laws pertaining to this subject, and to publish them for the benefit of science. (4) Those manufacturers who conform to the required standards should be aided by the Bureau.

Municipal government is also drawing its lines closer. Recently the Board of Health of New York City adopted the following resolutions:

“ WHEREAS, Recent investigations have shown that malarial fever is an infectious disease and can be largely prevented by the adoption of simple precautions; and WHEREAS, It is the desire of the Department of Health to prevent the extension of malarial fever, which now exists in some of the boroughs, to the other boroughs, and to restrict its prevalence in those boroughs where it already exists;

“ *Resolved*, That all public institutions, hospitals, homes, asylums, etc., be required to report all diseases of malarial fever which come under their observation, giving the name, age, sex, occupation and present address of the patient, and also information as to whether the attack is a primary infection or a relapse, and the address where the disease was probably contracted.

“ *Resolved*, That all physicians in the city of New York be requested to furnish similar information in regard to patients suffering from malarial fever under their care.

“ *Resolved*, That the circulars of information of the Department of Health regarding the causation and prevention of malarial fever be mailed to the addresses in which malarial infection has apparently been contracted, and also to the addresses from which the cases are reported, when these are different.

“ *Resolved*, That postal cards for furnishing the required data be prepared and forwarded to institutions and physicians for reporting the cases of malarial fever which come under their observation, as is done in other infectious diseases.”

These resolutions, if carried out in a generous spirit, bid fair to over-

whelm the department, and evidently portend a very active mosquito campaign. These efforts of municipalities to control disease, if inaugurated and carried out by boards of medical men above the suspicion of political motive, may prove very valuable; but there is always a lurking fear that they may become the means of petty tyranny. When it is in the power of the municipality, on the dictum of some hidden and perhaps (though we hope not) venial member of the profession, to interfere with the business, the freedom, and the fortunes of those whom it may choose to consider its enemies, or to let those evade its power whom it considers its friends, a very dangerous condition has been reached.

Medicine backed by the power of city or state, can become a tyrant from whom there is no appeal. It says "diphtheria" or "scarlet fever," and there is no higher court that can reverse its decision. It desides that there is danger of contagion, and isolates a tenement with its teeming population. It determines that one method of disinfection is better than another, and there is no gainsaying it. This being the situation, it becomes doubly important that health officers and boards of health should be chosen from and consult with the wisest of our profession, and that the American plan of employing any one rather than an educated physician to decide such matters should come at once to an end.

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## NEUROLOGY.

**INSANITY.**—The progress of the alienist is slow when we compare it with the strides made in so many other fields of medical research. We give below a plea for an earlier diagnosis and an earlier treatment of insanity. The alienist recognizes, of course, that we are all somewhat insane; and in these days, when a slight redness of the pharynx is or may be incipient diphtheria and a crumb on the tonsil may be a deadly colony, and as such be much safer for antitoxin immunization, the alienist, not to be a laggard, puts in his plea. Hospitals for the insane are unpopular for the incipient insane; and one writer urges a combination of insane asylum, sanitarium, and rest cure, to which people might go without suspicion and from which they might depart without an indelible stigma. But if cases are to be taken early, who would escape? Might we not simply change the names of our great hotels,—for everybody lives in them now,—add a staff of skilful alienists, and let the inmates remain? "The Waldorf-Astoria Retreat"

would give no chilling shock, and how much good might result to unborn millions! Some day, when the brain and nervous system have been at last completely studied and understood, every mental process localized, and the seat of the soul really found, then we may have a real treatment of the insane. At present the matter lags. It seems sometimes as though the vast majority of cures in asylums were produced rather by bringing the hysterical and the pseudo-insane face to face with real insanity in all its horror, till the false thing which has grown on excitement, wilfulness, and uncurbed passion, seeing what it might be, recoils and is cured. Or, in another class of cases where delusions really exist and "voices" are really heard, the patient, otherwise sane, denies their existence, and, frightened at the possibility of continued confinement, hugs them silently in his bosom life long, but goes out cured. Such cases are to be found everywhere by careful inquiry; they make a considerable proportion of the reported percentage of cures. For the rest, food and care and gentleness and time, with removal from the exciting causes, do their happy work; but as for the therapeutics of insanity they can scarcely be said to exist.

**THE EARLY DIAGNOSIS OF INSANITY AND NERVOUS DISEASES.—**  
The importance of the early diagnosis of insanity and the various forms of nervous disease is being impressed more emphatically upon the medical profession as a whole. Neurologists and alienists reply to the criticism of the lack of cure in cases of insanity and nervous diseases even after the most painstaking diagnosis, by stating that the time to cure these conditions is in their incipiency, when they are still in the hands of the general practitioner. Jones, in an address before the Southeastern Division of the Medico-Psychological Association, in April, 1901, dwelt upon the importance of the knowledge of the various forms of insanity by the general practitioner. He showed that in Great Britain and Ireland, there is on the average one case of insanity to every two hundred and sixty-six persons. He believes that every public institution of insanity should be made a school for post-graduate teaching; for he believes that the time to treat successfully the various forms of insanity is in their early stages. In this country, Chase, in the address on Mental Disorders before the Pennsylvania State Medical Society, 1901, takes up this same point, especially in regard to paresis. It is only at an early stage that there is the slightest hope of arresting this dread disease from a fatal termination.

**THE COMPETENCY AND CREDIBILITY OF INSANE WITNESSES.—**  
The introduction of the testimony of two patients from the Bellevue College Hospital in a recent trial by the District Attorney of New York, raises again the interesting question as to the admissibility of

the testimony of the insane. The Supreme Court of the United States, in an opinion upon a similar case, gave the following ruling:<sup>1</sup>

"It is undoubtedly true that a lunatic or insane person may, from the condition of his mind, not be a competent witness. His incompetency on that ground, like incompetency for any other cause, must be passed upon by the court, and to aid its judgment evidence of his condition is admissible.

"The general rule, therefore, is that a lunatic or a person affected with insanity is admissible as a witness if he have sufficient understanding to apprehend the obligation of an oath, and to be capable of giving a correct account of the matters which he has seen or hears in reference to the question of issue, and whether he have that understanding is a question to be determined by the court, upon examination of the party himself, and any competent witnesses who can speak to the nature and extent of his insanity."

AËROPHAGY.—The spasmodic swallowing of air followed by eructations of gas has been studied during the past year by many French observers. Mathieu believes<sup>2</sup> that carminatives, antiseptics, and absorbing powders have absolutely no effect upon the condition. By the use of self-control Mathieu believes a quick recovery from this condition may be accomplished, and he labors to make his patients understand that they can control the eructations by an effort of will. It is commonly regarded as a more or less hysterical manifestation.

SYSTEMATIZED EXERCISE IN NERVOUS DISEASES.—The use of systematic exercise in various forms of nervous diseases, such as locomotor ataxia and paralysis agitans, is gradually attracting more attention. Taylor<sup>3</sup> gives the report of the result of his use of these exercises in various cases of paralysis agitans. He gives the history of one case as a typical example. A man, fifty-two years of age, who had been afflicted with the disease for seven years, had sunk into such a deplorable condition that the only voluntary motion remaining was the festinating gait. Contractures in the tissues of the trunk and neck and cervical and dorsal curvatures of the spine were pronounced, and the patient had lost the power of articulate speech. Taylor began the treatment of this case with the massage of the thickened skin and passive extension of the contracted muscles. As time passed away voluntary motions were increased, which produced at first pain, then tingling, and finally pleasurable sensations, until the patient found that he was able to write and speak and perform light tasks.

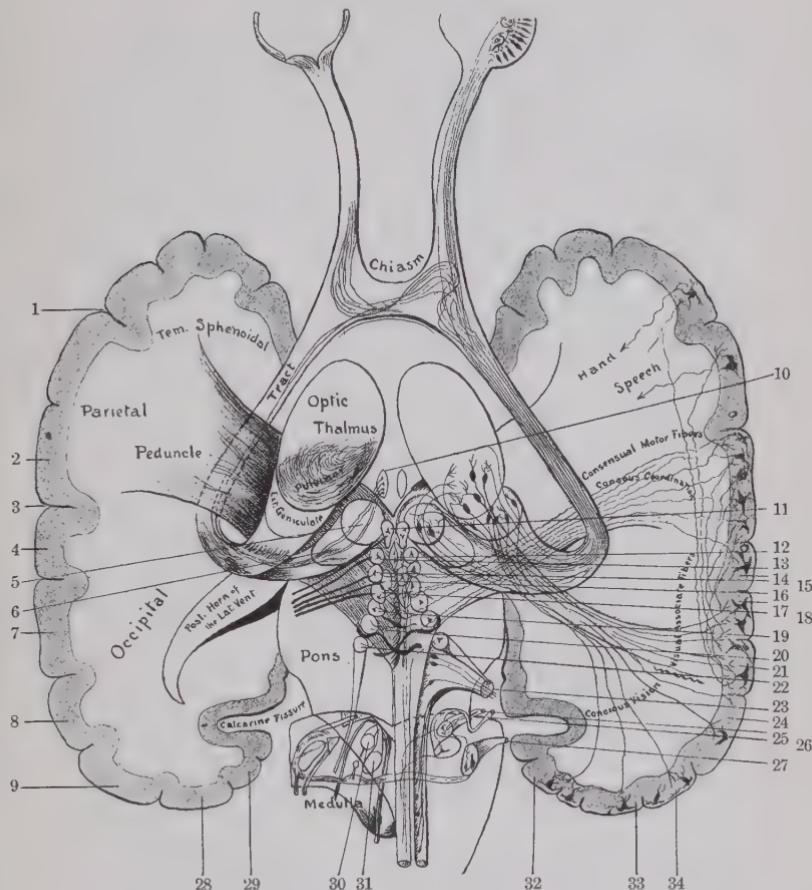
<sup>1</sup> American Journal of Insanity.

<sup>2</sup> Philadelphia Medical Journal, June 29, 1901.

<sup>3</sup> Journal of Nervous and Mental Diseases, March, 1901.

NEURONIC ARCHITECTURE OF THE VISUAL APPARATUS.—Dr. Louis Stricker, of Cincinnati, Ohio, illustrates<sup>1</sup> by an excellent chart pre-

FIG. 12.



1, Inter-parietal fissure; 2, gyrus angularis; 3, parieto-occipital fissure; 4, second occipital lobe; 5, anterior corpora quadrigemina; 6, internal geniculate body; 7, third occipital lobe; 8, occipito-temporal lobe; 9, gyrus descendens; 10, corpus Luysii; 11, sphincter pupillæ; 12, accommodation (ciliary muscle and iris muscles); 13, to levator muscle; 14, gyrus angularis; 15, to superior rectus muscle; 16, to internal rectus muscle; 17, second occipital lobe; 18, to inferior oblique muscle; 19, to inferior rectus muscle; 20, IV nerve; 21, third occipital lobe; 22, V nerve; 23, fifth nerve; 24, occipito-temporal; 25, VI nerve; 26, VII nerve; 27, VIII nerve; 28, lingual nerve; 29, cuneus; 30, VI nerve; 31, VII nerve; 32, cuneus; 33, lingual nerve; 34, descendens.

pared from the anatomical studies of St. Bernheimer, of Vienna, the neuronic architecture of the visual apparatus (Fig. 12).

<sup>1</sup> Journal of American Medical Association, March 2, 1901.

## TOXICOLOGY.

**BLINDNESS FROM WOOD ALCOHOL.**—The increasing domestic use of this alcohol, its employment for the chafing-dish and alcohol-lamp, and its use in the manufacture of certain varnishes by reason of its cheapness, render its poisonous properties of much more moment than was formerly supposed. Since 1896 many cases of permanent or transient blindness, complete or partial, have been recorded. Moulton states that the clinical histories have much in common, and that amblyopia usually appears in from twelve to forty-eight hours after exposure to this agent. Narrowing of the field of vision is characteristic, and central vision fails first, the pupils being widely dilated and fixed. There are no early marked changes in retina or optic nerve, and in fact but slight changes at any stage have been noticed. In severe cases nausea and vomiting have occurred, and even death has ensued, or recovery with complete loss of sight. In mild cases, temporary improvement may occur, but early progressive optic atrophy is the usual termination. Stieren,<sup>1</sup> however, reports a case of complete recovery of sight in five days. Blindness, or impairment of vision, has followed not only the ingestion of wood alcohol, but also, there is reason to believe, from inhaling its fumes. Extracts, perfumes, and cordials, as well as ordinary spirits, are liable to be adulterated with it; and it seems probable that many unexplained cases of sudden blindness owed their loss of sight to this hitherto unsuspected cause, which, like food adulteration, is a danger to which modern scientific methods and competition daily expose us all. We will have in the future to consider many such conditions which have been overlooked, like the question of the effects of cold storage on foods in connection with the recent increase of scurvy in unusual quarters, and many more equally interesting problems. The experiments of Birch-Hirschfeld upon rabbits and chickens appear to locate the primary lesion in these cases of wood-alcohol blindness in the ganglionic cells of the retina. Moulton also reports a number of cases of poisoning following the use of cheap essences and the poorer grades of bay rum. No other agent, he remarks, possesses such a dangerous predilection for the retina and optic nerve.

**Poisoning by Aniline Oil.**—A case is reported by Homer Depuy, of a girl of seventeen suffering from disease of the ear, for which she instilled hourly fifteen drops of a mixture of cocaine, fifteen grains to

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<sup>1</sup> Journal of American Medical Association, January 5, 1901.

the ounce of oil. After five instillations she became drowsy, suddenly cried out, and, losing consciousness, became blue in the face, with cold extremities and profuse perspiration; recovery followed in twenty-four hours.

**SULFONAL AND TRIONAL.**—Church reports a number of fatalities following medicinal doses, and also cases of disturbance of the alimentary tract and kidneys from their prolonged use. A case is also reported<sup>1</sup> of trional poisoning from the so-called "safe dose." Albumin and casts appeared in the urine and haematoxyluricuria, the latter disappearing in forty-eight hours after the withdrawal of the drug. The patient resumed it subsequently and continued its use till death, when several small areas of interstitial degeneration were found in the right kidney.

**FUSEL-OIL.**—According to Guy and Ferrier this is more intoxicating when inhaled than when taken into the stomach. Small doses produce pain and tension in the head; larger ones cause prolonged, profound sleep. Death has occurred after the injection of an ounce. The breath has a fruity odor, and in animal experiments its ingestion has produced glycosuria.

**COAL-TAR NAPHTHA.**—G. H. Douthwaite<sup>2</sup> reports a case of poisoning in a child of five after taking two ounces. Insensibility, cold extremities, small, rapid pulse, dilated pupils, and insensitive conjunctivæ rapidly followed; partial recovery occurred, but death later from congestion of the lungs.

**COBRA POISONING TREATED WITH CALMETTE'S ANTIVENINE.**—Hanna<sup>3</sup> presents an interesting report of a case of cobra poisoning treated in this way. In attempting to abstract the poison from an adult cobra the operator was bitten upon the thumb. Within half an hour eighteen cubic centimetres of Calmette's antivenous serum were injected. This was followed in the course of two hours and a half by symptoms of poisoning which manifested themselves in some paralysis of the legs, vomiting, and a mild stupor. About an hour later another injection of ten cubic centimetres was given, which was followed shortly by a disappearance of these unpleasant symptoms, although pain and swelling persisted in the region of the bite. In six weeks' time the wound healed. Hanna believes that this experience confirms the value of fresh antivenous serum promptly used.

<sup>1</sup> American Medicine, November 9, 1901.

<sup>2</sup> Lancet, January 26, 1901.

<sup>3</sup> Ibid., January 5, 1901.

## THERAPEUTICS.

**GONORRHOEA.**—Christian<sup>1</sup> raises the question as to what improvement has taken place in the treatment of this disease in the last ten years. Acute gonorrhœa, he believes, is treated more scientifically and with less discomfort to the patient, but the ultimate results are but little modified. The disease lasts as long as it did ten years ago. In chronic urethritis, however, treatment has advanced; exact localization is now accomplished. Syphilis is generally milder than it was ten years ago.

**GONORRHOEAL MYOSTITIS.**—Ware has been able to demonstrate this condition, microscopically, in the muscles of the posterior axillary fold. The section of muscle embedded in collodion shows an exquisite picture of interstitial inflammation. (Figs. 13, 14, 15.) For treatment, Ware recommends dry heat, local anodynes, and later massage, and in acute pain an incision to deplete and relieve tension.

**GLONOIN.**—In all conditions of spasmodic contraction of muscular tissue, Lewis finds glonoин of service. In angina pectoris it gives, in doses of one twenty-fifth of a grain, the most prompt relief. It may be continued at one hour intervals in  $\frac{1}{250}$  grain doses. In arterial sclerosis it delays the progress of senile gangrene and Raynaud's disease. In sciatica  $\frac{1}{50}$  grain can be combined with morphine, and in tabes dorsalis its continued use is advised. Combined with pilocarpine, it is of marked value in uræmic convulsion. Children especially tolerate it, and it has saved cases of cholera infantum with extreme prostration in doses of  $\frac{1}{250}$  grain.

**SUPRARENAL CAPSULE IN DISEASES OF THE HEART.**—Hoerschelm, from a study of one hundred patients, concludes that under the influence of this drug weak and irregular hearts become stronger and steadier; dilated hearts contract; diffused apex beat is localized; a diffused, loud, rough, mitral regurgitant murmur becomes localized and lessened in intensity, even disappearing at times. A very faint murmur in a weak heart becomes more distinct; normal sounds grow clearer; rapid pulse is less rapid; slow pulses are faster; and patients, weak with organic heart disease, improve, unless the pulse was strong and regular before its administration.

**UREA IN TUBERCULOSIS.**—Harper has obtained good results in phthisical cases from this remedy. In laboratory observations he

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<sup>1</sup> Therapeutic Gazette, November 15, 1901.



FIG. 13.—Section of the muscle (three millimetres) showing the diffuse extent of the connective-tissue proliferation.



FIG. 14.—Section of the muscle stained to show the gonococci.



FIG. 15.—Secretion from the muscle. Gram's stain, showing the gonococci counterstained.



failed to find a growth of tubercle bacillus in broth containing a small percentage of urea.<sup>1</sup>

**CIILORETOE IN EPILEPSY.**—McCarthy<sup>2</sup> thinks that in selected cases this drug is an excellent substitute for the bromides and can be given in a reduced dose after its good effects are established. It is best administered in capsules, enough, at first, to produce an hypnotic effect. One dose of fifteen or twenty grains is given at night, in cases when the fits occur at night, and as the number of fits diminish the dose is lowered one-half and continued indefinitely.

**SIMPLIFIED PRESCRIPTION WRITING AND DOSAGE FOR CHILDREN.**—Cowling's rule is to take the age at the next birthday and divide by twenty-four. Huhner<sup>3</sup> suggests a method of writing the prescription so as to avoid calculation. If the prescription contains twenty-four doses, then make the entire amount of any drug in the prescription the adult dose multiplied by the age of the child at its next birthday.

For example, in a child aged five years, taking three drugs, *x*, *y*, and *z*, of which the adult dose of *x* is five minims, of *y* eight minims, and of *z* ten minims, the prescription is written as follows:

Rx	<i>x</i> . . . . .	.....	
	<i>y</i> . . . . .	.....	
	<i>z</i> . . . . .	.....	
	Aq. . . . .	.....	q. s. ad, etc.

Now, if the entire quantity is three ounces and the amount taken at each dose one drachm, the prescription will contain twenty-four doses, thus:

Rx	5 <i>x</i> . . . . .	.....	25 m
	5 <i>y</i> . . . . .	.....	40 m
	5 <i>z</i> . . . . .	.....	50 m
	Aq. . . . .	.....	q. s. ad, 3 ounces

M. Sig.—One drachm t. i. d.

**GELATIN FOR CONTROLLING HEMORRHAGE.**—Sailor<sup>4</sup> thinks the following conclusions concerning gelatin are reasonable: (1) It increases the coagulability of the blood, whether applied locally, taken internally by the mouth, or injected subcutaneously or intravenously. (2) Applied locally it is usually harmless, and may, as Carnot suggested, aid in healing by improving the nutrition of the cells. It may be injurious by promoting bacterial growth, and should probably always

<sup>1</sup> Lancet, March 9, 1901.

<sup>2</sup> International Medical Magazine, August, 1901.

<sup>3</sup> Medical Record, November 24, 1900.

<sup>4</sup> Therapeutic Gazette, August 15, 1901.

have some antiseptic added to it. (3) Injected subcutaneously or intravenously it is entirely harmless, and with perfect technic practically painless. The solution should be thoroughly sterile; the dose employed should vary from one to three grammes of pure gelatin. (4) When administered by the mouth from one to three hundred grammes, or perhaps more, should be employed daily. (5) It is of advantage in any form of local hemorrhage, such as epistaxis, hemorrhoids, or injuries. (6) It checks certain forms of internal hemorrhage, such as haemoptysis, hematemesis, metrorrhagia, melena neonatorum. (7) It appears to be the best remedy at our command in the treatment of haemophilia, and to be of great advantage for purpura hemorrhagica, and in hemorrhagic forms of disease. (8) At present it seems to be contraindicated in only one condition, viz., acute nephritis.

**LIQUID AIR.**—When used in the treatment of carbuncle, White<sup>1</sup> states that this agent is less painful and requires only one application, pain ceasing within twelve hours. The spray is used, first projecting it into the openings, and using it freely, then thoroughly freezing the external surface which has first been thoroughly cleansed. The dressing is done with dry absorbent cotton. Reaction takes place in twenty minutes, and to the extreme hyperæmia success is attributed. Gangrene is reported to have followed the use of liquid air in treating a boil of the hand.

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## NEW REMEDIES.

The chemist toils merrily and ever makes new remedies; hospitals and clinics in distant lands try them on willing or unwilling victims, till we seem to hear the whole creation groaning; then back writers write up their wonderful properties and the marvellous cures they work; then the drug drummer comes with samples and generosity and loads them upon us, till even boundless faith falters and the honest real new remedy is suspected of being a tramp drug. It is hard to find patients on whom to try all samples, and the conscientious doctor who eats them himself may never write up his own case. Still, among the pebbles, if we keep on searching, we may light on a jewel unawares, even though the field be "salted" till we cannot see the ground.

**ACETOPYRIN** and **EUPYRIN** are compounds, the one of antipyrin

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<sup>1</sup> Journal of American Medical Association, February 16, 1901.

and acetyl-salicylic acid, the other of centipyrin and vanillin ethyl carbonates. They are both antipyretic and antineurinalgic.

ACOIN is a powerful anaesthetic in the eye when injected under the conjunctiva.

ACOPYRIN (acetyl salicylate of antipyrin) is a new antipyretic and antirheumatic, resembling salipyrin. It dissolves with difficulty in water, easily in alcohol, and the dose is seven and one-half grains.

ACTOL, ARGENTAMIN, and ARGONIN are new silver salts used in affections of the eye.

AIROL (bismuth oxyiodogallate) has been highly recommended as a substitute for iodoform. Demidor, after a very extended trial, is convinced that it has remarkable bactericidal power.

ALBARGIN, a gelatinose silver preparation, is used by Borneman in a two-tenths per cent. solution as an antiblennorrhagic.

ASPIRIN (acetyl salicylic acid) has been used as a substitute for the salicylates. Trifold urges its use in fifteen-grain doses in neuralgia, giving the drug dry, followed by carbonated water.

ASTEROL (paraphenol sulphotartrate of mercury) is a bactericidal agent of some power, which acts in albuminous solutions. Being mercurial, its action must be watched. It may be used for the disinfection of the hands, and does not injure instruments.

BISMAL, bismuth methylene digallate, is used in the same class of disorders, and the dose is five grains.

BISMUTHIPOSE is a combination of bismuth and albumin and is used for eczema and burn. Internally, it is also used in cholera infantum and diarrhoeas; its dose is from one-half to one teaspoonful, several times a day.

BROMINOL, a combination of bromine and sesame oil, has been used as a substitute for potassium bromide.

CALCIUM IODATE contains fifty-one per cent. iodine and sixteen per cent. available oxygen. It is used externally and internally. In an acid or alkaline medium it slowly liberates iodine, acting best in the latter. It is rather a destroyer of bacterial products than a bactericide.

CHIROL, used for disinfection of the hands, is considered by Schaeffer to lack any especial value.

CHLORALOSE.—Tyson finds this drug quicker in action than any hypnotic except morphine; five grains being the maximum dose.

CHLORETOSE is recommended by Stevens<sup>1</sup> for sleeplessness. From an experience with fifty cases he believes it a safe hypnotic in ten-

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<sup>1</sup> New York Medical Journal, February 23, 1901.

twenty-grain doses; there are little after-effects, but tolerance is rapidly established.

CUPROL is the nucleinate of copper, and is a useful astringent to irritated mucous membranes, as of the conjunctiva.

IONIN (ethyl morphine hydrochlorate). Majewsky reports nineteen cases of cerebral congestion in which he employed this drug in hypodermic injections of .04 gramme with excellent results. It is not as effectual when given by the mouth. Most of his cases were maniacal.

DORMIOL, an amyleno chloral, is recommended by Kelly as an excellent and safe hypnotic.

DYMAL is a new powder for dusting wounds, it is non-irritating and antiseptic.

EPICARIN, a combination of beta-naphthol and creasotic acid, is useful in psoriasis-eczema and scabies in ten per cent. solution or a ten to twenty per cent. ointment.

EUGUFORM, an acetylated diquaracolide of methylene, is recommended by Spiegel in wounds, burns, lupus, and other skin diseases. It allays pain and itching.

EUNATROL, oleinate of sodium, has been used with apparent benefit in gall-stone colic. It should be given hourly, in doses of two to four grains.

FANGO, according to Hollopeter, is a grayish-brown mud brought from certain Italian lakes containing iron, sulphur, magnesium, and lime. It is used by local application in diseases of muscles, paralyses, neuralgias, and rheumatism, at a temperature of from 98° to 120°. Probably it has no more value than other hot applications, its constituents not being absorbed.

FORMIN, hexamethylene tetramine, is claimed to be a uric acid solvent and genito-urinary antiseptic. Bardet<sup>1</sup> claims that taken internally it energetically eliminates uric acid. Formin probably yields free formaldehyde in passing through the organism.

GUACAMPIOL, camphoric acid extract of guaiacol, is suggested as a remedy for the night-sweats of phthisis.

GUAIAKINOL, dibrom-guaiacolate of quinine, according to Castel (notes on new remedies, June, 1901), can be used both externally and internally.

HEDONAL.—Squibb recommends this drug in doses of thirty grains as an excellent hypnotic, sleep occurring in half an hour and being very prolonged.

<sup>1</sup> Bulletin général de thérapeutique, March 15, 1901.

IODOMUTH is a new preparation of bismuth containing twenty-five per cent. of iodine. It is reddish in color, antiseptic and sedative in action, practically odorless, and is superior to boric acid, as it is more haemostatic. It makes a clean, effective, and safe dressing for wounds.

ICHTHALBIN, a combination of ichthylol and albumin, is suggested as a substitute for ichthylol. It decomposes when it reaches the intestines into sodium ichthylolate. It is successful in flatulence and intestinal fermentations and externally in ulcers, in catarrhs, and in gynaecological affections, as well as in chronic nasal catarrh, granulating wounds, and skin diseases.

ICHTIARGON contains thirty per cent. of silver, and penetrates dead animal tissue more deeply than silver nitrate.

IODOCROL has been used by Cattani in pulmonary tuberculosis, tuberculous bronchitis, and bronchial asthma.

ITROL, silver citrate, is an antiseptic, and is used for gonorrhœa, wounds, and skin diseases, and in mouth washes and ointments.

LARGIN, a compound of silver and protalbin, containing eleven per cent. of silver, is used as a bactericide, especially in gonorrhœa and in ulcers of the stomach and intestines.

LYSOFORM has been recommended as a disinfectant for the hands. Ahlfeld, after thorough trial, declares that it possesses no special advantages.

MERCUROL, a compound of mercury with nucleinic acid, contains about ten per cent. of mercury. A five per cent. solution contains one-half per cent. of mercury in a form which is non-corrosive and non-irritant. It does not precipitate albumin. Solutions must be freshly made. It has proved useful in suppurative otitis. Mercurol, according to Lake,<sup>1</sup> is an efficient antiseptic.

NARGOL.—This silver salt, it is claimed, does not coagulate albumin.

NIRVANIN.—Flöckinger<sup>2</sup> reports a series of cases operated upon under anaesthesia produced by nirvanin injections. Ordinarily a two per cent. solution is employed. A decinormal salt solution is the best solvent for this drug, to which may be added a little muriate of morphia.

PNEUMIN and PULMOFORM are recommended in pulmonary tuberculosis.

TANNALBIN, TANNIGEN, and TANNOFORM have been used by Preis in the intestinal diseases of children; the two latter he discarded as

<sup>1</sup> Lake, Lancet, December 15, 1900.

<sup>2</sup> Buffalo Medical Journal, September, 1901.

inefficient, but tannalbin was of benefit in intestinal catarrhs and tubercular diarrhoeas.

UROSINE is a double citrate of urotropin and lithium, and has been used as a substitute for the former and as a solvent for uric acid deposits.

VIOFORM has been suggested as a substitute for iodoform; it is inodorous.

YOHIMBE, an African tropical plant of the order of *Apocynaceæ*, has been recommended as an aphrodisiac, causing hyperæmia and increased activity of the genitals without apparent ill effect upon the kidneys. Mendel and Löwy found it useful in sexual neurasthenia and of negative value in spinal affections. Bartholow states that in experiments upon animals, Yohimbin, its active principle, acted as a central paralyzer of motility but not of sensibility. With muscular paresis, spasms of the muscles and nodding movements of the head occur; respiration is affected, the heart is weakened, and ultimately paralyzed, stopping in diastole.

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## SURGERY.

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### GENERAL ANÆSTHESIA.

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During the year the final report of the Committee of the British Medical Association on anæsthesia has been made public. The report, however, adds very little to our previous knowledge on the subject. It confirms the popularity of chloroform in Great Britain, and is based upon 25,920 cases, embracing administrations of forty-three different anæsthetics and mixtures or successions of anæsthetics. Chloroform was used in 13,393 cases, ether in 4595, nitrous oxide in 2911, gas and ether in 2071, A. C. E. mixture in 678. Chloroform was most dangerous, being concerned in seventy-eight deaths, or .582 per cent.; ether in three deaths, or 0.065 per cent., including in this nitrous oxide. The report decides that ether is generally the safest routine anæsthetic, though certain circumstances may in particular cases make some other material safer and easier. The committee makes no decision as to the best methods of resuscitation.

In an interesting symposium on this subject,<sup>1</sup> Finney states that the

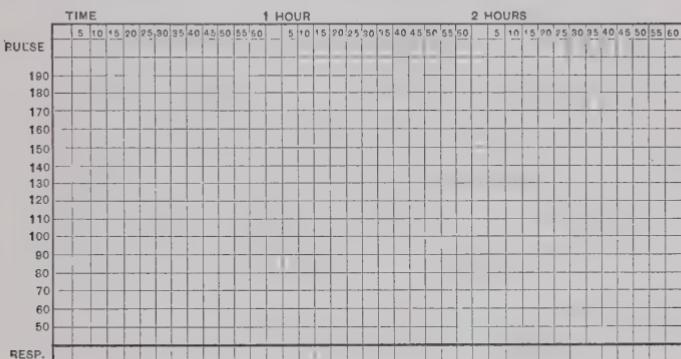
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<sup>1</sup> American Journal of the Medical Sciences, August, 1901.

anæsthetizer plays almost as important a rôle as the operator, and urges the establishment of a thoroughly competent corps of anæsthetists throughout the country. He concludes, from his analysis of one hundred and forty cases of heart disease, that only in myocardial affections do anæsthetics exercise any bad effects; valvular disease is a very slight contraindication for their use. He also gives a chart in use at Johns Hopkins Hospital, providing for a record of the patient's condition at five minute intervals (Fig. 16).

FIG. 16.

NAME.....	WARD.....	OPERATION.....
DATE.....	ANÆSTHETIC.....	
AMOUNT TO ANÆSTHETIZE.....	TIME TO ANÆSTHETIZE.....	
TOTAL AMOUNT.....	DURATION OF ADMINISTRATION.....	



REMARKS.....	SIGNATURE.....
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It would appear that if this chart is to be filled out by the busily occupied anæsthetizer, he might probably be somewhat distracted from the more important work on hand. As for organizing and educating a corps of skilled administrators, that could easily be done; the course of study would be simple and short,—quite practical, in fact,—and while such assistants would undoubtedly be a comfort to the operator, it must be remembered that the great requisites in accidents of this kind are presence of mind and the immediate readiness of every known means of resuscitation. Hare states that oxygen forced through an anæsthetic may probably create chemical changes and consequent danger; he believes ether to be still our safest agent, except in vascular disease, in atheromatous conditions and high arterial tension due to vascular changes. Given with care, ether may be used in Bright's dis-

case, while chloroform is dangerous in myocardial change, and nitrous oxide in vascular degeneration. Intrap spinal injection for anæsthesia will soon be a medical curiosity.

NITROUS OXIDE AND ETHER.—On Clover's method of administering first nitrous oxide and then ether, Hewitt<sup>1</sup> reports that it is the best now known; a special apparatus has been used by him with tubes larger than in Clover's inhaler, and this somewhat obviates cyanosis and stertor. Dr. S. Osman Goldan, at a meeting of the College of Physicians and Surgeons, Philadelphia, April 3, 1901, gave a description of his apparatus for the purpose. He believes it to be the safest anæsthetic with no contraindications. The patient on the table takes six breaths of nitrous oxide, then oxygen. He induces anæsthesia in two minutes. He reports one hundred cases of major operations, the longest time being nearly three hours; the respiration and pulse remained normal and the after-effects were slight. The method is expensive and requires a skilled administrator.

ETHYL BROMIDE AND CHLOROFORM.—These have been given under observation in three thousand cases by Zematsky<sup>2</sup> in a period covering fourteen years. Narcosis is rapid, twenty to fifty seconds, the longest preliminary stage being twenty minutes. Five to ten grains of ethyl bromide are given first, then chloroform is dropped on the mask. Atheroma and alcoholism are contraindications. Gleitsmann has used ethyl bromide in five hundred operations without serious accident.<sup>3</sup> He operates for enlarged tonsils and adenoids with the child in sitting position, lowering the head and shoulders rapidly to prevent filling of the larynx.

CHLORIDE OF ETHYL.—Mackie reports the use of chloride of ethyl in forty-two cases<sup>4</sup> with no accidents. It has simplified and made more easy his work in nasal surgery, its local action making his operations almost bloodless; but as the local anæmia passes off violent hemorrhage may ensue.

In the *Medical News*, November 21, 1901, Tuttle reports two hundred and thirty cases where ethyl chloride was used. He regards it as safe, if carefully used, and it is ideal for minor operations. He has collected over two thousand cases with no unpleasant symptoms and no deaths. Goldan, in the same issue, considers both ethyl bromide and chloride as more dangerous than ether or chloroform.

<sup>1</sup> *Lancet*, March 30, 1901.

<sup>2</sup> *Vrach*, August 25, 1901, and *Monthly Cyclopædia of Practical Medicine*, December, 1901.

<sup>3</sup> *Medical Record*, November 2, 1901.

<sup>4</sup> *British Medical Journal*, September 28, 1901.

METHOD OF SCHNEIDERLIN.—Korff has operated on eighty cases, using injections of scopolamine and morphine at an interval of two hours before anæsthesia and conducting the operation itself under chloroform. Only one-third as much chloroform is required, there is no nausea, and the patients are readily awakened.

### SPINAL ANÆSTHESIA.

The general consensus of opinion seems to be that spinal cocainization possesses but slight value in ordinary operations, that the procedure is only suited to extraordinary conditions, and that its dangers and discomforts are many. One can see by a glance at the above excerpts that ether still holds its place as the best, most universally useful, and safe agent, and that bromide and chloride of ethyl and nitrous oxide gas, while perhaps best for a few specially selected cases, are used with that caution which is a sign of our progressive age, and which is a danger-signal to the searcher for new methods of anæsthesia. The combined use of two agents involves complicated apparatus and is cumbersome, without sufficient gain to warrant its use. Always allowance must be made for the avidity with which novelties are sought for and urged and used by the many active minds who are seeking to rise in an overcrowded profession on the ladder-rounds of new and attractive things.

In medicine, spinal cocainization has been used during the year by Guillavin<sup>1</sup> and by Pulla<sup>2</sup> in sciatica in one acute case where  $\frac{5}{64}$  grain of cocaine was injected with immediate relief, return of pain in higher degree, and gradual disappearance finally. The second case was very severe, and twenty drops of two-per-cent. solution were injected with great relief.

Sherrill concludes<sup>3</sup> that spinal anæsthesia is not likely to be of use in operations above the diaphragm, nor in uncertain and difficult abdominal operations; but commends it principally in amputations and excisions in lower extremities and in old persons with heart, lung, or renal disease and abdominal dropsy, and where general anæsthesia is dreaded.

Corning<sup>4</sup> suggests induction of spinal anæsthesia by cataphoresis with a special apparatus, with a double tube, introducing his tube between the spinous processes of the third and fourth lumbar vertebrae until it reaches the ligamentum subflavium; then thrusting for-

<sup>1</sup> Gazette Hebdomadaire de médecine et de chirurgie, April 4, 1901.

<sup>2</sup> La riforma medica, November 4, 1901.

<sup>3</sup> American Medicine, October 26, 1901.

<sup>4</sup> New York Medical Journal, May 4, 1901.

ward the inner tube and piercing the ligament, yet leaving the dura and arachnoid uninjured; he then injects the anæsthetic upon the dura, after which the cataphorizing apparatus is employed.

Cathelm<sup>1</sup> suggests a modified form of cocaine injection into the sacral canal in the epidural space to relieve neuralgias of the lower extremities, the lightning pains of locomotor ataxia, lumbago, and sciatica. The injections are made at the apex of a triangle, between the sacrococcygeal ligament and the spinous processes of the fourth and fifth sacral tubercles, using an ordinary syringe with a needle six centimetres long and a diameter of seven-tenths of a millimetre. The patient is in the knee-elbow position or on the side. The finger of the operator is pressed down the median line till it falls into the triangular depression; the needle is introduced at its apex exactly in the median line, passing obliquely upward and forward. Four centigrammes of cocaine are injected, the solution being one to two hundred; the cocaine enters the epidural space and is absorbed by osmosis.

Dumont<sup>2</sup> reports on three cases of spinal cocainization unfavorably. He has also collected a number of cases with disastrous results, quoting Gumprecht's seventeen fatal cases.

Bainbridge,<sup>3</sup> reporting twenty-four cases of operation under spinal anaesthesia, concludes that cocaine is far better than eucaine, being more thorough and reliable; that analgesia to the level of the diaphragm always follows a moderate dose of a potent solution of cocaine; and, in some cases, the analgesia suffices for operation on the upper extremities, even complete analgesia, including eyes, mouth, and throat, having occurred. Properly prepared for an anaesthetic, the patient has little more unpleasant effects to fear; moderate doses of bromide beforehand frequently prevent vomiting and headache. When vomiting occurs the preservation of consciousness prevents the ejecta finding entrance into the larynx. Analgesia lasts from half an hour to four hours. The use of ethyl chloride largely prevents the pain of puncture. The preparation of the patient, the use of nitroglycerin, bromides, or the coal-tar products with caffeine, control the after-coming headache. Motor paraplegia or vertigo will be temporary, neither normal nor diseased kidneys are affected, usually tactile power, muscular sense, and the perception of heat and cold are retained, and the patient sleeps the first night. For a few hours there is usually a rise of temperature, neither circulation nor respiration are seriously affected.

<sup>1</sup> *La presse médicale*, June 15, 1901.

<sup>2</sup> *Correspondenz-Blatt für schweizer Aerzte*, October, 1901.

<sup>3</sup> *Medical News*, May 4, 1901.

NEW METHODS OF DIAGNOSIS IN CONNECTION WITH LUMBAR PUNCTURE.—Diagnosis by lumbar puncture and the examination of withdrawn fluid has been studied by the Société de Biologie, of Paris. Assuming that cerebrospinal fluid in the normal state contains no formed elements, Widal and his colleagues<sup>1</sup> found that in acute meningitis the fluid undergoes various alterations, and they collected the sediment by centrifugalization. In twelve cases they found no bacteria in tubercular meningitis, but noted a remarkable number of lymphocytes. They also endeavored to determine the freezing point of the fluid in different diseases. The cryoscopic point in fifteen non-meningitic cases varied from .56 to .75 degree, although in the majority the fluctuation was from .60 to .65 degree. In a large number of cases of meningitis the freezing point was found to be lower than the above, the high point being about the same as the low point in non-meningitic cases.

CEREBROSPINAL FLUID IN CHOLÆMIA.—Gilbert and Castanage practised lumbar puncture on eighteen subjects with jaundice, finding the fluid in fifteen cases free from bile-pigments, while in three positive results were given. In the latter, grave nervous phenomena were present, and animal experiments indicate that biliary salts injected into the subdural space are intensely poisonous. The presence of the bile in the cerebrospinal fluid in cases of cholæmia suggests a permeability not naturally present. Penetration of toxic principles in the subarachnoid space may accompany anaemia.

PERMEABILITY OF THE MENINGES.—Widal and his associates after studying the permeability of the meninges to iodide of potassium, especially in connection with tuberculous meningitis, state that the arachnoid-pia membrane is by nature impervious; and that in the normal individual the diffusible iodide cannot reach the subarachnoid space. The imperviousness seemed to disappear in tubercular meningitis, as the iodide was readily detected in the cerebro-spinal fluid. The determination of the permeability to iodides, the freezing point, and the "cyto-diagnosis" previously mentioned offer a procedure which may possibly be a substitute for the test for the bacillus.

TREATMENT OF CEREBROSPINAL MENINGITIS BY LUMBAR PUNCTURE.—Koplik reports a series of cases treated by the "Quincke method."<sup>2</sup> He made the punctures from the fifth to the thirty-seventh days of the disease, withdrawing from three to fifty cubic centimetres of the fluid. The fluid continued turbid up to the thirty-seventh day,

<sup>1</sup> Medical Review of Reviews, March 25, 1901.

<sup>2</sup> Medical News, March 23, 1901.

and in the examination of Councilman it was found that a diminution in turbidity frequently occurred with absence of micro-organisms. The operation was indicated when pressure symptoms or an accumulation of exudate were noticed, and as long as there was improvement the patient was not disturbed. There was no marked effect on the pulse or respiration, and no harmful results.

### GENERAL SURGICAL SUBJECTS.

CURE OF CHRONIC BRIGHT'S DISEASE BY DECAPSULIZATION OF THE KIDNEY.—George M. Edebohls,<sup>1</sup> in an interesting article, describes this operation, the cases in which he has resorted to it, and his rationale of its action. The proposition to treat Bright's disease in this way was first made by him on April 22, 1899 (*Medical News*); he had then had six cases with four favorable results, in which the operation was primarily performed for movable kidney. In five cases there was no thought on his part of benefiting the existing kidney disease. Since then, in one hundred and ninety-one nephropexies there were sixteen cases of Bright's disease. None of these, after operation, received any other treatment. Of the eighteen cases operated on by Dr. Edebohls, five had right chronic interstitial nephritis, four left chronic interstitial nephritis, four right and left, two right and left chronic parenchymatous nephritis, and three right and left chronic diffuse nephritis. The diagnosis of the condition of the kidney or kidneys by observation becomes easy. In fourteen of the eighteen both kidneys were operated on—in twelve at one time, and in two at two different times—and in four on one kidney only, always the right one. That one kidney could have Bright's disease was a surprise to him, since at autopsies this is not noticed; he believes many begin with one, and both are affected before death. The diagnosis was based upon every known method of examination. The operation leads to a cure by establishing proper circulatory conditions.

ATHLETICS AND APPENDICITIS.—Athletics as a cause of appendicitis has been often suspected, the disease attacking suddenly the best and most active individuals of both sexes. Morris believes that he has seen cases undoubtedly caused by the traumatism of a rigid and tense psoas muscle applied suddenly to a vulnerable appendix in violent exercise, like riding up hill on the bicycle. Tennis, also, has come in for its share of blame as well as the repeated bending back of the thorax in

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<sup>1</sup> New York Medical Record, December 21, 1901.

calisthenic exercises. Certainly the number of cases requiring operation seems to have greatly increased, and we are driven to the supposition that it would not, if left alone, be so fatal as we think, or that it occurs more often than of old.

**THE SURGICAL TREATMENT OF GASTRIC ULCER.**—A definite advance in surgery has been made by the operative treatment of ulcer of the stomach. The rapidly increasing statistics on this subject demonstrate the fact that, under certain circumstances, the surgical treatment of this condition may replace the medical with far better chances for the recovery of the patient. Angus<sup>1</sup> reports a case of gastric ulcer complicated by acute haematemesis, in which the patient who was operated upon four hours after the hemorrhage began made a good recovery. In the same place Horrocks reports a similar case in which a successful operation was performed eight hours after perforation took place. The interesting feature of this case was that there had been no indication of the existence of a gastric ulcer previous to the occurrence of perforation. Ferguson in the same journal, October 19, 1901, also reports a successful case. Wharton and Musser report operation and recovery in a case of perforated gastric ulcer in a man of forty-eight. That the operation may be successful even when performed some time after perforation is shown by a case reported by Shettle,<sup>2</sup> the patient being a young woman upon whom he operated twenty-eight hours after the accident.

Robson has been the most active operator in this field, and he has given the profession valuable information from time to time during the past year. It is impossible to give in full Robson's interesting communications (read before American Surgical Association, May, 1901), but his results are noteworthy. His operations on the stomach already number over two hundred.

In one hundred and seventy-seven operations for simple diseases of the stomach, including perforation and hemorrhage, he records one hundred and sixty-five patients' recoveries, 93.2 per cent.

The technic is very simple, necessitating only two continuous sutures, one of chromicized catgut to unite the mucous margins of the two openings, and one of celluloid thread to unite the serous surfaces about a quarter of an inch away from the new opening. Pagenstecker's thread or spun celluloid has replaced silk in his practice, it being stronger, easily sterilized by boiling, and less absorbent.

The bobbin is a cylinder of decalcified bone with raised ends, which

<sup>1</sup> British Medical Journal, March 23, 1901.

<sup>2</sup> Ibid., May 11, 1901.

is placed in the new anastomotic opening, around which the sutures are applied.

The serous suture is first applied around the posterior half of the circle. The needle still threaded is then laid aside till the final stage; the openings into the viscera are then made, and any redundant mucous membrane cut away; the mucous suture is next applied uniting the posterior half of the circle; the bone bobbin is now inserted and the mucous suture continued around the anterior half circle until it reaches the point where it was begun; the two ends are then tied firmly: the serous suture previously laid aside is now picked up and continued around the anterior half circle until the loose end of the celluloid thread is reached, when the two ends are tied firmly.

The advantages claimed for the method are:

1. That it assures the proper size of the opening.
2. That it secures an immediately patent channel between the two anastomosed viscera.
3. That the bobbin protects the new line of union from pressure and from the irritation of the visceral contents for from twenty-four to forty-eight hours.
4. That it facilitates the application of the sutures.
5. That no foreign material is left in the alimentary canal, which may cause subsequent trouble, for the bobbin rapidly dissolves in the alimentary juices.
6. That the method has been proved by ample experience to be rapid, easy, efficient, and safe.

Maunsell,<sup>1</sup> from a review of the statistics of operations of this class, draws the conclusion that the percentage of recoveries in the hands of those who are accustomed to operate, is at present between forty-five and fifty per cent., and he believes it is never too late to operate except the patient be moribund.

Lund<sup>2</sup>, in reporting a successful operation for perforating gastric ulcer, emphasizes the importance of diagnosing the symptoms of the pre-perforative stage.

Bramwell,<sup>3</sup> in a lecture before the Edinburgh Royal Infirmary, takes issue with the statistics of the mortality and frequency of gastric ulcer as collected by Mr. Robson. He thinks that Mr. Robson has overestimated both the total mortality and that due to hemorrhage. He also attacks the statistics given by Welch which showed gastric ulcer

<sup>1</sup> British Medical Journal, March 23, 1901.

<sup>2</sup> Boston Medical and Surgical Journal, June 6, 1901.

<sup>3</sup> Lancet, March 9, 1901.

to have been present in five per cent. of 32,052 autopsies. He states that it is unreasonable to suppose that because five per cent. of the autopsies made in hospitals revealed ulcerations that the frequency of this lesion is the same in the general mortality, for gastric ulcer, according to this authority, is very much more common in hospital patients than in the general population. Bramwell found only twenty-seven instances of it, or  $\frac{44}{100}$  of one per cent., in six thousand one hundred and twenty-three cases, seen in his private practice. Reviewing Robson's statistics of the annual mortality from gastric ulcer in Leeds, he found there were probably eighteen cases of death from this cause last year, whereas Robson computed the annual mortality to be 81.25. He believes, therefore, that death from hemorrhage in cases of gastric ulcer is of rare occurrence. Personally, he has had only one death from this cause in his long experience.

REPORT ON THE SECOND THOUSAND CASES OF EXTIRPATION OF GOITRE.—Kocher<sup>1</sup> first states emphatically that he performs only excision, rarely enucleation. He has given up the latter operation, and has not changed his technic. He never severs the muscles. He has devised a forceps for compressing the isthmus, not to exert pressure on the blood-vessels, but to permit the use of smaller ligatures. Kocher's mortality is four per cent. Infection plays no rôle. He introduces no antiseptic into the wound, only the ligatures, for which he uses silk exclusively. He has used the prophylactic treatment with thyroid extract before operation, in cases of diffuse and long-standing goitre. He seldom or never induces narcosis, he operates under cocaine, thereby avoiding the abundant hemorrhage caused by vomiting. Kocher would give struma intrathoracica an especial place in surgery. As a result of the struma profunda he has seen emphysema, bronchitis, tachycardia, etc., and he claims that goitre lung as well as goitre heart exists. The main question in cases of struma intrathoracica is whether the mass is movable or not, the movable struma naturally promises more favorable operative results. Kocher then demonstrated the diagnostic value of the Röntgen rays combined with percussion, and showed a goitre which extended to the second intercostal space. In regard to the technic of the operation for struma intrathoracica Kocher ligates all the blood-vessels and divides the isthmus before extracting the goitre; he demonstrated a forceps and spoon which he had had constructed to facilitate rapid extraction. Tamponade is never performed, since it can cause choking, and is no guarantee that hemorrhage is checked. In regard to the medicinal treatment of goitre

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<sup>1</sup> German Surgical Society, 1901.

Kocher states that he has given up the thyroid extract and has returned to the old treatment with potassium iodide. This treatment may cause acute and chronic iodism, which, however, can also follow the use of thyroidin. He calls attention to the fact that in those countries where goitre abounds, very few phosphorus-containing foods are consumed, while in England, where goitre is practically unknown, eggs and meat form the main food constituents. In the discussion of this paper Kraske reported four hundred and twenty operations with favorable results, and he stated that he has entirely abandoned the treatment with the thyroid extract as valueless.

SURGICAL TREATMENT OF CIRRHOSIS OF THE LIVER.—The results of the surgical treatment of this affection are steadily becoming more satisfactory. Packard and Le Conte<sup>1</sup> present a report of two cases of cirrhosis of the liver in which the mesentery was stitched to the abdominal wall to establish collateral circulation. The first case was that of a man sixty-three years of age, whose condition was alarming, on account of the failure of repeated tapping to relieve the ascites. The patient remained depressed and weak after the operation and died fifty-three days later of heart failure and pulmonary oedema. The second case presented a similar history. From a review of the literature these authorities believe that statistics entitle this operation to a distinct place in surgery, notwithstanding the fact that the victims of cirrhosis are poor subjects for operation. They think that when the diagnosis of periportal cirrhosis of the liver can be established,—as was not in one of their cases,—and persistent and well directed medical treatment has been in vain, the operation should be urgently recommended. On the other hand, surgical interference is rarely indicated, possibly contraindicated, in cases of ascites, associated with other forms of cirrhosis (Hanot's, syphilitic, mixed, etc.), or with chronic peritonitis. The following method of operation is recommended under local anaesthesia, or chloroform narcosis, the use of ether being condemned in view of the danger of kidney complications: "The incision is made above the umbilicus, and a little to the left of the median line, to avoid injury to the vein in the round ligament. The liver is then inspected and palpated to confirm the diagnosis. A small opening is made in the median line above the pubis, through which the fluid is siphoned off while the operation above is being completed. The parietal peritoneum over the omentum, liver, and spleen (if the latter organ be enlarged) is dried and gently rubbed with a gauze sponge, the surfaces of the organs are treated in the same way. Rougher hand-

<sup>1</sup> American Journal of Medical Sciences, March, 1901.

ling is entirely unnecessary, as a healthy peritoneum when brought in contact with dry gauze for a fraction of a minute will retain the impression of the gauze mesh. The omentum is then stitched in two or three places with catgut to the anterior abdominal wall and the incision closed. If the operation is undertaken in a hospital, where it is reasonably certain that a drainage tube will be properly cared for, drainage may be made through the lower opening, particularly in cases where the ascites has been rapidly reaccumulating. If, however, competent nursing cannot be provided, the lower wound should be closed and tapping resorted to until the establishment of collateral circulation. Drainage is very useful for three or four days, until the adhesions become firm; to continue its use for more than a week entails unnecessary risk to the patient, as, owing to the abundant secretion of fluid, a tube track is probably not so quickly formed as in an ordinary laparotomy, and therefore the danger of infection is greater. If the Trendelenburg table be used, the patient may be raised to a semi-sitting position while the ascitic fluid is being siphoned off. After the dressing is applied the abdomen should be encircled with broad adhesive straps from the ensiform cartilage to a point below the umbilicus, in order to keep the parietal and visceral peritoneum in contact. The operation can be quickly finished, and should be scarcely more dangerous than an exploratory laparotomy, but we must remember that other organs beside the liver are frequently diseased (the heart, kidneys, and blood-vessels), and subjects with these lesions bear operative interference poorly."

#### THE TOPICAL TREATMENT OF FOCAL AND JACKSONIAN EPILEPSY.

—White has come to the conclusion that the results of surgical intervention in true focal epilepsy are not sufficiently encouraging to justify ignoring the great risk entailed, and the paralysis caused by excision of the epileptogenic centre without which operation trephining is unsatisfactory. He endorses the observation of Clark, who writes:

"Epileptics in whom seizures are of the Jacksonian type should be trephined only when infantile cerebral palsies can be excluded, and when the family and personal degeneracy is at a minimum." He adds that if operation is determined upon in such cases, the epileptogenic area should be completely removed, and that even then but a fraction of one per cent. recover from their epilepsy. He might also have stated that the operation, apart from its crippling effect, is sure to be followed by considerable mortality. It was to lessen this risk to life and to secure the chance, however slight, of cure or amelioration without paralysis of important muscle-groups, or of entire limbs,

that White was led to consider, and finally to employ, the following method:

"The location of the affected centre is, of course, determined in advance by most careful study and observation. Its topographical relation to the cranium is indicated by a silver or iodine mark upon the shaven scalp two days before the operation. The scalp is sterilized and re-sterilized three times at intervals of twelve hours, not only before trephining, but also before each subsequent application of the treatment. A horseshoe-shaped flap is raised and a half-inch button of bone removed with a small trephine. The dura is left intact. Thirty minimis of a sterile two per cent. solution of eucaïne are then injected at the centre of the trephine opening, the point of the needle being introduced about three-quarters of an inch into the brain substance. The needle is gradually withdrawn while the last ten minimis of the solution are being injected. The flap is replaced, the patient is put to bed, and on the day of operation, and on the following day, should receive full doses of bromides. At intervals, the proper length of which can be determined only by experience, the scalp having been sterilized as above, the injection is repeated. The patient should be kept in bed at least four hours after each injection, and should take bromides for one or two days."

White merely submits this method to the profession for further trial and elaboration, or, perhaps, for rejection; he is not convinced that it has any real value. He reports two cases operated upon in this way which present encouraging prospects.

**THE DIAGNOSIS OF INTESTINAL PERFORATION IN TYPHOID FEVER.**  
—The year's work in typhoid fever has been principally directed to the subject of operation for intestinal perforation and to antityphoidal inoculation. Osler<sup>1</sup> has prepared a schedule of instructions in cases of typhoid fever which will be useful not only for hospital residents but for physicians in private practice.

I. Instructions should be specific and definite to the night superintendent and head-nurses to notify the house-physician of any complaint of abdominal pain by the patient, of hiccup or vomiting, of a special rise of pulse or respiration, of sweating, or of signs of collapse.

II. House-physicians should note the character of the *pain*. As to (*a*) *onset*, whether only an aggravation of slight abdominal pain, such as is common both with constipation and with diarrhoea, or whether it was a sudden, intense pain which caused the patient to

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<sup>1</sup> Phila. Med. Journal, January 19, 1901.

call out, and which, though relieved by stupes and ordinary measures, soon recurred in paroxysms and grew worse.

(b) *The locality*, whether diffuse or localized in the hypogastric or right iliac regions; radiation, as to its position. It is to be borne in mind that abdominal pain of a severe character may be associated with an acute pleurisy, with distended bladder, with cholecystitis, and with a packed rectum, or may follow an enema.

III. *State of the Abdomen*.—The condition to be noted in writing at once as to the following particulars:

(a) Whether flat, scaphoid, or distended. Whether, if distended, it is uniform or chiefly hypogastric.

(b) Respiratory movements, whether present, if uniform, and seen both below and above the navel.

(c) Palpation, as to tension and pain, locality and extent, and degree of pressure necessary to elicit; muscle rapidity and spasm, whether present or not, and in which special locality; noting particularly its absence or presence in the hypogastric region and the right iliac fossa.

(d) Percussion—character of note in front of abdomen and in flanks. Liver-flatness; extent; in middle, nipple, and in midaxillary lines. Note specifically every third hour. Remember, too, that obliteration may occur in a flat as well as in a distended abdomen. Auscultatory percussion may be helpful.

(e) Auscultation—obliteration of signs of peristalsis; presence of friction.

(f) Examination of rectum, whether tenderness, fulness between rectum and bladder.

(g) Stools—character; frequency; presence of blood or sloughs.

IV. *General Condition of Patient*.—(a) Facies, whether change in expression; risus, slight or marked; pallor; sweating, etc.

(b) Pulse—change in rhythm, rate, and force.

(c) Temperature, whether a drop or not, whether after a tub or not.

(d) Respiration—sudden increase; not infrequent; whether shallow or sighing.

(e) Sweating, if subject to, during attack; if onset with the pain; whether local or diffuse.

(f) Vomiting, whether with onset of pain or not; character of vomiting.

(g) Hiccough.

V. *Blood-count*.—Leucocytosis, stationary or rising. May be marked and early. In a majority of cases well studied there is a

rise. The constant leucopenia in typhoid fever has to be taken into account. Also a count of the red blood-corpuscles and haemoglobin, as a decided drop might suggest hemorrhage.

OPERATION FOR PERFORATION OF THE INTESTINE IN TYPHOID FEVER.—Jopson<sup>1</sup> concludes that but few cases recover in perforation without operation. Murchison gives five per cent.; Keen's tables show in one hundred and fifty-eight cases 15.4 per cent. of recoveries, and of these in the last seventy-five the recoveries were twenty per cent. Finney gives one hundred and twelve with twenty-three recoveries; in the Boston series of twenty-one cases only three recovered, while in Osler's wards six recovered in sixteen. If cases are in fair condition, they bear operation well, and children under fifteen have the best chances.

INOCULATION IN TYPHOID FEVER.—Wright<sup>2</sup> gives the statistics of the inoculated British troops in Cyprus and Egypt in 1900, when two thousand six hundred and sixty-nine were uninoculated and seven hundred and twenty were inoculated. Among the former the typhoid cases amounted to 2.5 per cent., and among the latter .14 per cent. The death-rate of the former was .4 per cent., of the latter, .14 per cent.

Caley<sup>3</sup> gives the results of inoculating the members of the Red Cross Hospital, for service in South Africa. There were three sections. The first, with four exceptions, were twice inoculated on the voyage, and in six months of overwork at Kroonstadt developed no cases. The second, eighty-two men in all, developed one case, in the only man not inoculated; while a third section escaped entirely.

Professor Wright, of the Army Medical School at Netley, in a very technical paper on Antityphoidal Serum<sup>4</sup> states, among other conclusions, that where the quantum of antityphoidal serum used is so small that constitutional symptoms are slight, a positive increased power of resistance supervenes at once without any intermediate period of increased susceptibility.

Walker,<sup>5</sup> after pointing out the difference between an antimicrobial and an antitoxic serum and the evidence for antityphoidal serum, states that such a serum can be obtained by immunizing horses; that

<sup>1</sup> Univ. of Penna. Med. Bulletin, March, 1901.

<sup>2</sup> British Medical Journal, May 4, 1901.

<sup>3</sup> Ibid., January 12, 1901.

<sup>4</sup> Lancet, September 14, 1901.

<sup>5</sup> Journal of Pathology and Bacteriology, vol. vii. p. 250, 1901, and American Journal of the Medical Sciences, September, 1901.

a high degree of immunization must be obtained; that the employment of living cultures in the later stages is desirable, and of as many and as largely different races of typhoid bacilli as possible; that its agglutinative power determines its value, and that its efficiency might be increased by immunization of the horses against *Bacillus coli communis* also.

**HEMORRHAIC PANCREATITIS IN TYPHOID FEVER.**—Chauffard and Ravaut<sup>1</sup> report a new complication in this disease. The condition which supervened very late in the course of the fever was at first diagnosed as perforation. The patient made a lingering and imperfect recovery, dying later of pneumonia. An autopsy revealed a pancreas surrounded by hemorrhagic cellular tissue, and the case is noted as one of rare occurrence.

**PRIMARY SPLENOMEGLY.**—In the *American Journal of the Medical Sciences* for April, 1901, Brill presents a valuable report on this exceedingly rare condition. This report is made additionally important by the fact that he reports three cases which he discovered in one family. The history of the family was negative, but three children, the third, fifth, and sixth, all suffered from splenic enlargement. The first and fourth child have shown no symptom of the condition, while there is a history that the second child died in childhood of chronic diarrhoea. The oldest child, a woman now, thirty-four years of age, noticed that her abdomen began to enlarge on the left side under the ribs. On examination this proved to be an enormous enlargement of the spleen. During an attack of typhoid fever this organ became soft, but subsequently enlarged again. The rest of her history is rather negative. Her blood has always been normal; she is fairly comfortable, although there is progressive emaciation. The enormous spleen has displaced the organs of the thorax and the lower part of the abdomen. There have been no attacks of fever, no signs of kidney trouble, and the liver is apparently normal. About seven years after the first appearance of the enlargement she noticed a tendency to sweating with the appearance of sudamina, which, a year later, became hemorrhagic. The second patient died at the age of nine years; he had never been well from his third year, and an enormous splenic enlargement was detected before his death. The third case was that of a man who noticed at the age of nineteen a slightly enlarged spleen. He too was suffering from sudamina and frequent attacks of nose bleed, and he exhibited an erythematous eruption about the nasal region. Examination of his blood showed it to be always normal.

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<sup>1</sup> Archives de médecine expérimentale, March, 1901.

The use of drugs in both these cases seemed to have no effect upon their condition.

ENTEROPTOSIS.—A weakened condition of the abdominal wall from whatever cause is the primary and most important factor in this condition. Einhorn<sup>1</sup> states that enteroptosis is, in the majority of cases, accompanied by a movable kidney. While this condition may exist without giving rise to any symptoms whatsoever, it is generally accompanied by gastric and intestinal disturbances. In looking over a large number of cases this authority has found it almost divided between males and females in nineteen hundred cases.

The abnormal position of the stomach can be diagnosticated in the following way: (1) The splashing sound; (2) inflation of the stomach with gas; (3) gastrodiaphany. Strong pulsation of the abdominal aorta, even simulating aneurism, is often seen, due to the partial uncovering of this organ by the slipping down of the stomach. The transverse colon may be found frequently as a ribbon-like body running horizontally above the navel. Einhorn regards the belt-test as a valuable auxiliary in diagnosis. The physician stands behind his patient encircling the lower part of the abdomen with both his hands; at the same time he partially lifts the patient. Should this procedure give relief it favors the presence of enteroptosis. The prognosis is good when the case is properly diagnosed; the treatment consists principally in the application of a well-fitting supporter, the administration of ample nutrition, and well-regulated exercise. Mistakes should not be made by using laxatives too freely. Iron, arsenic, and electricity, intragastrically, are generally of great benefit.

GALL-STONES.—Mosher finds<sup>2</sup> gall-stones less frequent in the United States than in Germany, 6.94 per cent. against twelve per cent. Liability increases with age, as gall-stones are rare before thirty. They are more frequent in the white race, 7.85 per cent., than in blacks, 5.51 per cent.; in women, 9.37 per cent. than in men, 5.94 per cent. These figures are derived from sixteen hundred and fifty-five autopsies at Johns Hopkins Hospital contrasted with eleven hundred and fifty reported by Schröder of Strassburg. Italia<sup>3</sup> reports a series of experiments on the formation of gall-stones by the action of certain micro-organisms. He concludes that: (1) The bacterium coli communis and bacillus of Eberth are the specific micro-organisms of cholesterol calculi. (2) The streptococcus pyogenes and

<sup>1</sup> Medical Record, April 13, 1901.

<sup>2</sup> Johns Hopkins Hospital Bulletin, August, 1901.

<sup>3</sup> La riforma medica, 1901, vol. xvii, p. 830.

the staphylococcus aureus may, rarely, cause cholelithiasis; and when they do, the stones would consist of salts of lime, as they never precipitate cholesterol. If the bacterium coli communis be associated with them their biochemical action is more rapid in the bile, and the calculi will be mixed,—cholesterol, lime salts, and biliary pigment.

**FAT NECROSIS.**—It seems probable that fat necrosis is frequently associated with gall-stones, and effort should be made to diagnose the condition, and where signs of obstruction of the common duct appear, early relief of this condition is indicated. Shifting abdominal pain little influenced by narcotics, with lividity, are suggestive symptoms. Death is the usual termination of the condition, but two recoveries being reported. In the case recorded by Beck the omentum and peritoneum were found studded with many white spots, angular, flat, or depressed, one to five millimetres in size.<sup>1</sup>

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## OBSTETRICS AND GYNÆCOLOGY.

The sexual disorders of the female seem to gain more relief from the surgeon than the analogous diseases in the male. It is true that the female genito-urinary system is necessarily more complicated, but, on the other hand, the abdominal cavity has to be invaded to reach it. Among male disorders one class appeals most distinctly, viz., that depending on and consequent to enlargement of the prostate gland, causing, in the aggregate, a very great loss of mature and still useful lives, and very much prolonged suffering. For the relief of these cases castration has been tried, but has failed to effect satisfactory and permanent cures. The obstacle is seemingly so trivial, yet so difficult to remove. It has been attacked through the urethra, the perineum, and the bladder, and at the present time the Bottini operation is most in favor, with the suprapubic method and excision of the prostate an easy second. The later statistics show a great diminution in mortality caused by the use of better instruments, better skill and experience, and a more careful selection of suitable cases.

**ASPHYXIATION IN DELIVERY.**—Smith<sup>2</sup> reports that the danger of asphyxia in direct presentation is reduced to a minimum by the introduction of a catheter into the child's mouth prior to delivery. Blacker

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<sup>1</sup> Journal of the American Medical Association, November 2, 1901.

<sup>2</sup> American Medicine, November 9, 1901.

shows that Pugh, of Chemsford, in 1754, advised the introduction of the obstetrician's hand into the child's mouth and depressing the tongue. Morlanne, of France, and Bigelow, of Harvard, early in the last century advised similar processes. Blacker believes that the best plan is rapidly to deliver the after-coming head, even disregarding laceration.

**ABDOMINAL DRAINAGE.**—Clark<sup>1</sup> concludes that abdominal drainage, as generally employed, is in direct opposition to the scientific knowledge upon the subject. After five years' experience (seventeen hundred cases) he bases his statements upon two facts: First, the great decrease of micro-organisms within an hour through their intra-peritoneal destruction and their rapid absorption into the general system, and the consequent inability to limit septic matter to any free surgical field within the abdomen. Second, vigorous streptococci which remain behind develop within six hours a repellent or destructive quality for leucocytes, precipitating a lethal fight before drainage can exercise any beneficial action. He believes that the thorough irrigation with normal solution of the peritoneal cavity after abdominal operations, and then leaving behind large quantities of salt solution, is the most effective preventive measure we have against post-operative peritonitis.

**OVARIAN GRAFTING.**—The testimony of experimenters seems to indicate that a properly transplanted ovary may continue to perform its full normal function; and that the symptoms of the menopause after removal of ovaries may be escaped, while pregnancies may reasonably be expected in certain cases. R. T. Morris<sup>2</sup> considers that the recorded cases of pregnancy after double ovariotomy are cases of pregnancy from accidental ovarian grafting. Ovarian grafting is most successfully done, either from a piece of healthy ovary or from a segment of an ovary from another patient, when the operations are so timed that the one who is to furnish the ovary is operated on at the same séance with the one who is to receive the ovary.

**PROLAPSE OF THE UTERUS AND VAGINA.**—Edebohls<sup>3</sup> suggests panhysterokolpectomy as a certain and permanent cure of this difficulty, the operation consisting in a complete removal of the uterus and vagina followed by operative obliteration of the columnization of the bed of the genital tract. The tubes and ovaries are not disturbed unless diseased. Obliteration and columnization of the bed of the

<sup>1</sup> University of Pennsylvania Medical Bulletin, May, 1901.

<sup>2</sup> Medical Record, January 19, 1901.

<sup>3</sup> Ibid., October 12, 1901.

removed uterus and vagina are effected by means of from seven to nine buried, pursing sutures of chromicized catgut placed about two to two and a half centimetres apart, and running parallel to each other. Each suture gathers a raw surface from the periphery in circular fashion and draws or purses them together in the median line, and is buried by being pushed upward towards the abdomen, while the next suture is being tied beneath it. A solid pelvic floor is built ten to fifteen centimetres in depth from peritoneum to perineum, and broad apposition is established of the base of the bladder and the anterior surface of the rectum, conditions similar to those obtaining in the male pelvis. The patient is kept in bed for a week after operation. Recurrence of prolapse is impossible after a correctly and successfully performed panhysterokolpectomy. The operation is indicated more especially where other operative procedures have failed. The interference with further marital relations must be explained, and accepted by the patient prior to operation. Four cases have thus far been operated upon with perfectly satisfactory results by the author.

FIRST MENSTRUATION.—After an analysis of twelve thousand cases of first menstruation in American girls, Engelmann<sup>1</sup> points out that the mental development is a factor which has been largely neglected and that it exercises a marked influence upon the functional development, determining precocity or retarding the establishment of menstruation. Race and heredity exercise but slight influence, while the development of puberty is a very little earlier in the country girl than in the working girl in town, probably due to insufficient nourishment and poor air from which many among the working classes in large cities suffer. The mental state, the mental development, the mental activity, and the nervous stimulus are especially active in influencing menstruation.

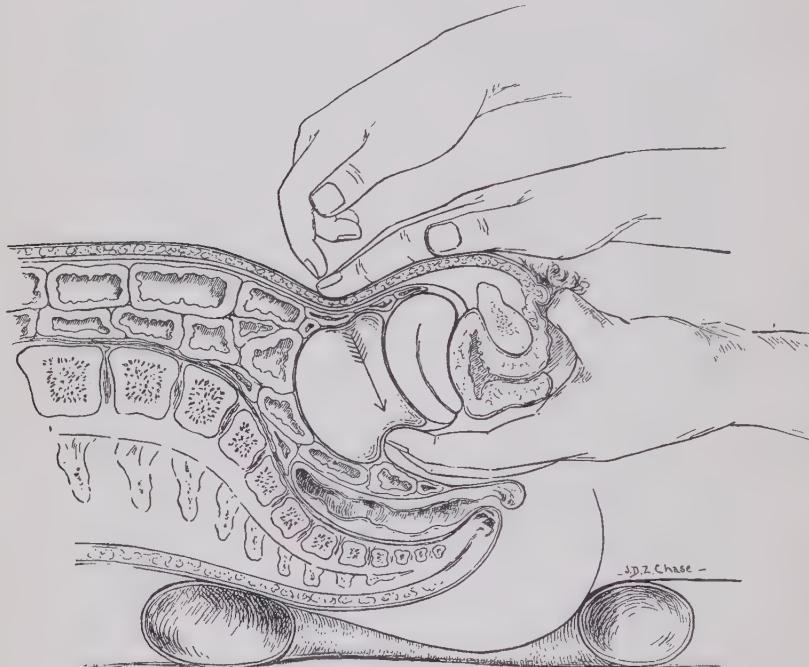
A HITHERTO UNKNOWN FORM OF UTERINE ATRESIA.—Landau reports two cases of what he believes to be a hitherto unknown form of atresia of the uterus.<sup>2</sup> The first was a woman of forty, who suffered regularly from menstrual disturbances without loss of blood. She was operated upon, unsuccessfully, in her eighteenth and her twenty-third year. Upon examination Landau found a huge fornix and cervix with evidences of a tumor. Operation revealed the uterus, enlarged and filled with blood, with haematosalpinx on both sides. The tumor was determined to be a mesonephron form of obstruction of the cervical canal and believed to be due to an embryonical hyperplasia of the lower part of the Wolffian duct.

<sup>1</sup> Philadelphia Medical Journal, June 18, 1901.

<sup>2</sup> Berliner klinische Wochenschrift, February 25, 1901.

REPEATED EXTRA-UTERINE GESTATION.—Varnier and Sens report<sup>1</sup> sixty-five cases where this condition occurred twice in the same woman, suggesting that this accident is more common than generally supposed. The gestation occurred but once in the same tube, and primary tubal gestation appeared in either side in about equal numbers. Normal pregnancy happened between the ectopic gestations in six cases. The time elapsing between the gestations was less than a year in a third

FIG. 17.



Trimanual percussion of fluid accumulation in the pelvis. The vaginal index-finger makes deep indentation in the vaginal vault posterior to the cervix, counter-pressure being made by the abdominal hand pressing down against the tumor mass, thus collapsing or displacing the intestine, while the assistant lightly percusses the tip of these fingers.

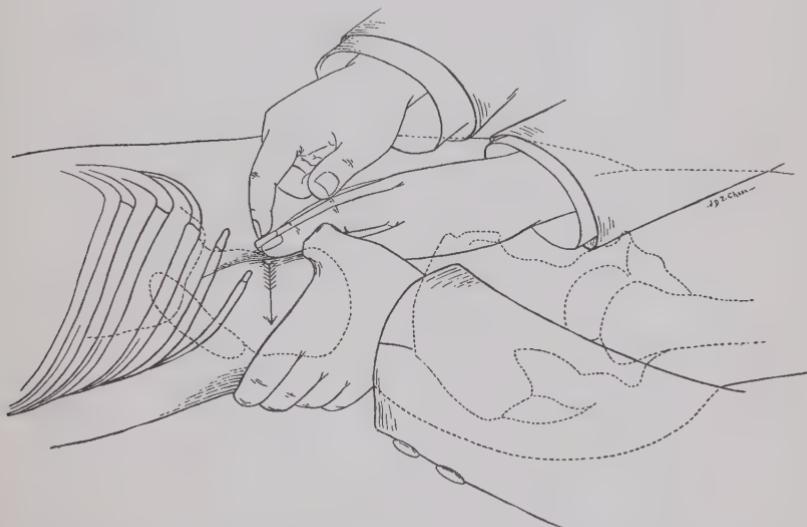
of the cases, varying from that to an interval of twelve years in one case. There was no record of three ectopic gestations occurring in the same patient.

A TRIMANUAL METHOD OF PERCUSSION FOR THE DETECTION OF CYSTIC OR LOCULATED FLUIDS OF THE ABDOMEN.—For the detection of fluid in obscure abdominal cases Clark has employed for the past two years a trimanual method of percussion devised by himself, which

<sup>1</sup> *Annales de gynécologie et d'obstétrique*, March, 1901.

has proved of signal value.<sup>1</sup> He first employed this method as a means of differentiation between fluid and solid pelvic tumors. On bimanual examination of a pelvic mass of questionable consistence the intestine intervening between the anterior abdominal wall and the tumor may dissipate the percussion impulse of the abdominal hand, and although fluid may be present, a wave of sufficient intensity to be felt by the vaginal touch is not induced. To overcome this difficulty the tumor mass should be confined as closely as possible between the two examining hands, while the percussion is made by an assistant. With light quick taps even small collections of fluid may be detected by the quick responsive pulsatile wave passing from the abdominal to

FIG. 18.



Trimanual percussion of fluid tumor in the region of the liver and kidney. One hand is sunk deeply into the loin, slightly posterior, thus pushing the tumor up as far as possible, while the other hand presses downward against the tumor. Percussion is then made by the assistant the same as in the pelvic examination.

the pelvic hand (Fig. 17). Since proving the value of this method of pelvic examinations Clark has systematically employed it in the differential diagnosis of abdominal tumors. In this way an adherent and distended gall-bladder may be accurately diagnosticated, one hand pressing deeply in over the hypochondrium, while with the other deep counterpressure is made just below the fixed ribs (Fig. 18). If fluid is present light percussion over the upper hand will give an unmis-

<sup>1</sup> University of Pennsylvania Medical Bulletin, May, 1901.

takable wave in many instances. In one case this method proved of considerable value in the differentiation of an appendiceal abscess situated beneath the cæcum and the lower lobe of a downward displaced liver. Only by the employment of this method was it possible definitely to recognize the deep-lying encapsulated pus, the ordinary percussion wave being destroyed by the superimposed liver. Clark has found this method of great assistance in clearing up doubtful cases which hitherto had been definitely settled only by exploratory incision.

**OOPHORECTOMY AND THYROID MEDICATION.**—Beatson<sup>1</sup> continues of the opinion after five years' experience that in inoperable mammary carcinoma where no secondary deposits exist oophorectomy is the line of treatment to be adopted, and that better results could be obtained in operable cases by the employment of this method than in the removal of the breast. In addition, thyroid extract is administered in doses of from five to fifteen grains daily. In connection with this, Herman reports eight cases thus treated, with the result that one is free from cancer after four years. In two the lives were prolonged eighteen months and in one twelve months, the patients in each case enjoying good health; while three were improved and one received no benefit.

**FOR THE RADICAL CURE OF CYSTOCELE.**—Taulbee<sup>2</sup> reports a method for the radical cure of cystocele in women by temporarily suspending the bladder. The operation is not free from danger, but he believes that the beautiful result in his reported case justifies him in advising its adoption.

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## PATHOLOGY.

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### CANCER.

**THE ETIOLOGY OF CARCINOMA.**—Dr. H. R. Gaylord reports<sup>3</sup> a series of observations which he believes determines the cause of cancer. The studies cover three years' work in the New York State pathological laboratory of the University of Buffalo. In all the cases of cancer

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<sup>1</sup> British Medical Journal, October 19, 1901.

<sup>2</sup> Am. Gyn. and Obstet. Jour., September, 1901.

<sup>3</sup> American Journal of the Medical Sciences, May, 1901.

that he examined he was able to separate organisms which resembled fat in the fresh state. The ether and the osmic acid tests showed, however, that they were not fat particles, and he discovered that their edges could be cracked with the cover-glass. Animals into whose abdominal cavities they were injected developed peritonitis in the majority of cases, and from the peritoneal fluid large numbers of these bodies were obtained. According to Gaylord, they can be found, if properly sought for, in every cancer, and may be injected into animals and subsequently recovered.

One case reported by Gaylord was an adenocarcinoma involving the greater part of the peritoneal surface and infiltrating the omentum and mesentery. A large portion had undergone mucoid degeneration, and the peritoneal cavity was filled with clear, straw-colored fluid. The abdomen was opened aseptically; some of this fluid which was removed through a sterilized tube and which remained free from bacteria, after an incubation period of thirteen days, contained a large number of hyaline bodies, which under the microscope were observed to increase in size, change form, and pass through a cycle of development until they reached what appeared to be a spore-forming stage. This final body was injected into three animals, of which two, a dog and a guinea-pig, received it in the peritoneal cavity, and one, a guinea-pig, in the jugular. In the first two there was no tumor formation, but a marked peritonitis and enlargement of the regional lymph nodes followed. The abdominal cavity of each animal contained a small amount of fluid, in which were detected the characteristic spherical bodies, nucleated bodies, and sacs filled with granules such as were present in the primary case.

A careful examination of a large number of tumors, including those removed by operation, shows that in all rapidly growing carcinomata, especially if large, a great number of organisms are present. Tumors of small size, as a rule, contain only the more diminutive of these bodies. After comparing growths removed by operation with those from cadavers, it becomes evident that the organisms either increase very rapidly during the period just before death, or they proliferate in the tissues of the cadaver.

Upon two large cancers in which immediately after operation the smaller forms predominated, and which were kept free from bacteria, the following observations were made. In each case an examination of the successive scrapings from the tumor, made several hours apart, showed that the relative size of the organisms gradually increased. In ten hours the amoeboid forms were greatly multiplied, and after twenty-four hours the spore sacs were present in large numbers for

the first time. Continuing the observations for a period of about three days, it was noticed in these few cases that the spores were ultimately replaced by groups of hyaline bodies, which were considerably larger than those originally contained in the sacs. Thus the so-called fatty degeneration of carcinoma was shown, at least in some part, to be due to the presence of various forms of the organism, which had been mistaken for fat-droplets and for infected epithelial cells supposed to have undergone fatty metamorphosis.

Gaylord also believes that in the centre of carcinomata which have undergone degeneration the so-called cancer milk of the older writers consists, practically, of a pure culture of these bodies. The fluid from malignant ovarian cysts contains a large number of them, and the peculiarly characteristic "mush" found in the cavities of certain adenocarcinomata of the ovaries is likewise mainly composed of the various forms of this parasite. This shows that organisms identical in appearance with those found in the peritoneal fluid of the first case mentioned can be found in all scrapings of cancer. The small, highly refractive form, which in suspension possesses a characteristic oscillating motion, the larger, pale variety, with projecting pseudopodia, and the sacular forms, containing highly refractive spherical bodies, can be detected with equal facility in the first scrapings of any malignant tumor. Gaylord promises a later paper, which has not yet appeared, but at present it is safe to say that his beliefs upon the parasitic nature of cancer are not generally accepted by the profession.

Lyon<sup>1</sup> discusses the distribution of cancer. The Buffalo statistics concerning it for the period from 1880 to 1899 are taken as a basis. It seems that the Germans and Poles have carcinoma of the stomach more frequently than the native born. Lyons believes this to support the parasitic theory, and that the diet of the Germans is more likely to contain the infecting agent than that of other classes. Cancers of the breast and uterus, on the other hand, were hardly more than half as frequent as in the native born, which he regards as still further confirmatory of the parasitic theory. He notes that between 1880 and 1899 general carcinoma increased from thirty-two to fifty-three per one hundred thousand of the population.

AUTOINOCULATION OF CANCER.—Dr. A. T. Cabot<sup>2</sup> reported a case of accidental inoculation of cancer in a fresh wound during an operation for removal of the original growth, which at the end of four years had not returned, while in two years a growth was noticed in

<sup>1</sup> American Journal of the Medical Sciences, June, 1901.

<sup>2</sup> Boston Medical and Surgical Journal, May 16, 1901.

the site inoculated. This on removal proved in character identical with the original tumor. The sites of the two growths were six inches apart. The anatomical situation precluded the idea of its being a secondary growth through the glands.

**THE ALLEGED INCREASE IN THE FREQUENCY OF CANCER.**—Recent statistics of death in New Jersey show more mortality from cancer than from all the infectious diseases combined. On the other hand, the statistics of Massachusetts<sup>1</sup> show the rate for that State to be about the same as in other States and countries, but with greater variation between the male and female cases than in Austria, where there is a remarkable correspondence in the ratio in the two sexes. Better diagnosis and more careful registration would seem to account for a great part of the increase.

#### GENERAL PATHOLOGICAL SUBJECTS.

**THE NEW SPECIFIC BIOLOGICAL BLOOD TEST.**—One of the most important contributions to scientific medicine, if definitely established, and of especial value in medicolegal investigations, is the new blood test. Prior to this the expert could only determine whether or not a certain stain was caused by blood; but it is alleged that he can now say authoritatively, even after many years have elapsed, from what animal the stain was derived. If a few drops of the blood of an animal be added to the serum of a similar animal, a cloudiness and finally precipitation occur; if the animals be of different kinds, no reaction takes place. But should the blood of an animal be injected at intervals for a few weeks into the circulation or peritoneal cavity of a different kind of animal, there is developed in the blood of the second animal a something which when brought into contact with the serum of the first will produce the precipitation. Thus, in a suspected blood-stain some animal—*e.g.*, a rabbit—is selected and receives repeated injections of human blood. The animal is bled and a few cubic centimetres of serum are collected. The blood-stain is then washed with a small quantity of normal saline solution, a few drops of the dissolved blood-stain are added to the serum of the rabbit, and, if the blood of the stain have been derived from a human being, the precipitation will appear. Under similar circumstances the blood of no other animal will thus react except that of the higher apes, with which the precipitation is delayed and is less pronounced.

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<sup>1</sup> Whitney, Boston Medical and Surgical Journal, July 18, 1901.

The test has been carefully investigated by Wassermann, Schutze, and Uhlenhut and confirmed by Dinkelpiel and Nuttall. Ziemke finds that the nature of the material does not interfere with the demonstration of the test.

**DISSEMINATION OF BACTERIA BY ORDINARY AIR CURRENTS.**—Hutchison and Kirstein<sup>1</sup> sprayed cultures of the *Bacillus prodigiosus* into the air of a room, and subsequently found the bacilli between the leaves of books kept open by matches, in Petri dishes placed in closed bureau drawers, and in adjoining rooms with closed doors between. The length of time that the organisms remained in suspension varied with their size and specific gravity, the amount of moisture present, and the strength of the air currents. If the air was quiet, most of the organisms settled down within half an hour; slight unavoidable air currents in the lower strata kept them suspended for considerable periods. Walking causes them to rise about ten millimetres from the floor, and sweeping disseminates them throughout the room, even to the ceiling. Rapid passage in a straight line from an infected atmosphere will draw bacteria along for a considerable distance. In the open air collections of bacteria sometimes float along in a more or less concentrated mass and may be carried by very slight currents of air as far as six hundred metres. Ordinary air currents do not disturb bacteria from surfaces upon which they have dried, but if once deposited on dust they may be readily blown about.

The longevity of organisms dried in compact masses varies enormously from that of those which are well spread out. Non-spore-builders when sprayed in fine droplets live for a very short time. While wall-papers may be extensively infected in a short time, the infection does not persist. Light and dryness are the main germicidal factors. In Petri dishes kept in the dark *Bacillus prodigiosus* was active after seven days, while in those exposed to the light for one or two days no organisms were found.

Experiments were also made to test the transmission of bacteria on paper. Sheets of paper were exposed to the air in which the cultures were sprayed, and mailed in sterile envelopes to near and distant points, from which they were immediately returned unopened. A sheet returning in twenty hours gave positive results; another returning in six days was negative. Hence infection is dependent upon resistance of organism. Two sheets of sterilized paper were sent over the same route, returned unopened, and found to contain a number

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<sup>1</sup> Zeitschrift für Hygiene und Infektionskrankheiten, xxxv., and American Journal of the Medical Sciences.

of bacteria and moulds, showing that infection in the mails is possible.

THE IMPORTANCE OF THE HÆMOLYMPH GLANDS.—In his investigation on this subject Warthin<sup>1</sup> examined eighty cadavers. He found these glands in greatest abundance in the connective tissue of the retroperitoneal prevertebral region and in the cervical region below and behind the thyroid gland. They were scarce in the mediastinal tissues and along the thoracic vertebrae. He found that these glands vary greatly in size and number, while their vascularity is remarkable. They exist in relation to the lymph glands in the ratio of from one to twenty to one to fifty. To indicate their structure and probable function he makes two types of these glands, splenolymph and marrow-lymph glands, but he called attention to the fact that transition forms exist extending to the spleen on one side and the ordinary lymph glands on the other. The hæmolymp glands ordinarily play but little part in the formation of red blood-cells, being largely concerned with leucocyte formation and hæmolysis. Should the blood show marked changes, the condition of these glands indicates their blood-forming function distinctly. He points out the intimate connection between adipose tissue and lymphadenoid tissue and the probable metaplasia of the former into the latter. A thorough study of these glands is undoubtedly necessary to complete our knowledge of the pathology and physiology of blood formation and destruction.

THE DIPROGONOPOLOS GRANDIS, A NEW TAPEWORM.—J. Kuri-moto<sup>2</sup> describes a tapeworm which is larger than the *Tænia solium* or the *mediocanellata*, being about ten and a half centimetres broad and ten metres long. Its uteri are in two sets parallel to each other; the breadth of the individual joint far exceeds its length. There are deep furrows on both its dorsal and abdominal surfaces, and its ovum differs in shape from that of other tapeworms. In the ordinary tape-worm new segments are produced by the head, the segments at the distal point being the most mature, but in the new variety each segment divides and the old and the young alternate. The symptoms caused do not differ from those due to the common species, except in being more intense. Treatment is the same.

TAPEWORM.—Messineo and Calamida<sup>3</sup> believe that the effects of tapeworm are due more to a toxic substance secreted by the *Tænia* than to its mechanical presence. They found that by injections and

<sup>1</sup> Journal of the Boston Society of the Medical Sciences, April 3, 1901.

<sup>2</sup> The Sei-I-Kwai Medical Journal; Medical Record, November 30, 1901.

<sup>3</sup> Medical Record, November 23, 1901.

inoculations of extracts of tapeworm constant and characteristic symptoms were produced, such as tremor, depression, paresis of both extremities, and somnolence. Control tests showed that the results were not due to proteid substances, but especially related to the tape-worm. All species tried gave similar results.

THE OCCURRENCE AND CAUSES OF GREEN OR BLUE URINE.—Weber<sup>1</sup> states that individuals apparently well, who pass green or blue urine without any obvious cause have, as a rule, indulged in candies colored with methylene blue. The excretion of such green or blue urine generally occurs in children and young women who partake freely of sweets, which, as illustrated by a number of instances, are often responsible for the phenomenon. Characteristics by which blue or green urine may be recognized as due to methylene blue are as follows: 1. When one decigramme of methylene blue is ingested, the urine which is passed an hour or so afterwards has a greenish tint; later it becomes of a deeper green and finally blue. The color produced by the blue lasts three or four days. Occasionally on the fifth day the greenish tint may be still noticed in the morning urine, though on the preceding day the mid-day urine was not discolored. When sweets which contain methylene blue are taken at intervals during several weeks, it is not surprising to hear that only the morning urine was colored green. 2. The amount of methylene blue determines the color of the urine, varying from a faint greenish yellow to a deep blue. When such urine is placed upon white paper or blotting paper, it is colored blue. 3. Boiling sometimes intensifies the color of the urine, for the reason that methylene blue is excreted as a colorless chromogen. The color will also appear when the urine is heated with acetic acid. 4. Filtering lessens the color of the urine. 5. A solution of caustic potash, without heating, decolorizes the urine. Boiling with strong nitric acid or hydrochloric acid also decolorizes, while cold nitric acid produces no effect upon the color. 6. Chloroform has the property of taking up the dye when mixed with urine, and this substance rapidly becomes blue. Ether, however, does not become colored. Chloroform mixed with an aqueous solution of methylene blue gradually becomes mauve and afterwards purple or red. When blue or green urine is examined with a good spectroscope, sometimes absorption bands can be made out, identical with those yielded with the aqueous solution of methylene blue.

THE USE OF "HELTHIN" FOR TESTING THE PURITY OF DRINKING WATER.—The presence of nitrous acid in drinking water is the surest

<sup>1</sup> Lancet, September 21, 1901.





COLOR No. 1.—Light pink, showing a water that is not good, but which may be employed in case of necessity.



COLOR No. 2.—Rose-pink, showing a water unfit for drinking.



COLOR No. 3.—Claret (Magenta), showing a water that is extremely dangerous to health.

FIG. 19.—Color scale for water tested with “helthin.”

sign of the presence of anaërobic and noxious bacteria. The examination for its reaction has, however, been somewhat neglected, in consequence of the uncertainty and want of sharpness in the tests required for its recognition. Nitrous acid is known to be the chief chemical product of the life activity of the cholera, typhoid, and many other dangerous bacteria. It is never absent in water contaminated with animal matter, and hence its presence shows a suitable nutrient medium for bacteria, even when in amounts too small to be recognized by taste or odor. On the other hand, all good drinking water is entirely free from the acid. Erdmann<sup>1</sup> has greatly simplified the method for the detection of nitrous acid, at the same time making it more delicate by the use of amidonaphthol-K acid, which for convenience is termed "helthin." To make the test, five cubic centimetres of a two-per-cent. sulphanilic acid solution are added to fifty cubic centimetres of the water to be tested; ten minutes later a seven and a half grain tablet of "helthin" is added. In a very short time there occurs a more or less intense claret-hued discoloration varying in depth of shade in proportion to the amount of nitrous acid present. After standing for an hour the tested specimen can be compared with the color scale. (Fig. 19.) If preferred, nitrite solutions, one to one million, one to one hundred thousand, and one to ten thousand, may be employed as standard color tests. The only caution to be observed is that some waters after being tested with "helthin" give a yellowish-brown discoloration when they have stood for a long time, but this has no significance; absolutely pure drinking water will remain colorless.

BERIBERI.—Captain E. R. Rost, I. M. S., of Burma, describes<sup>2</sup> a diplobacillus which forms a sort of angle. He has been working on the idea that beriberi is a rice disease, and has found the organism between the starch cells. Several kinds of fermented rice water are used by the natives, and a peculiar yeast, which is obtained from Singapore, is used to produce them. Captain Rost has also found the same peculiar organism in the blood of beriberi patients, in the cerebro-spinal fluid, and in the serous exudation of the sheath of the sciatic nerve. The organism develops spores and is very active, "wagging one rod in front of the other." In thirty-two cases of beriberi the organism was found in every one. A severe outbreak of beriberi occurred in the Madras infantry in the early part of 1901.<sup>3</sup> About twenty-five per cent. of the regiment was affected, and the mortality was low.

<sup>1</sup> Zeitschrift für Angew. Chemie, 1900, No. 2.

<sup>2</sup> Indian Medical Service paper for December, 1900.

<sup>3</sup> The Lancet, February 23, 1901.

According to the *Lancet* for May 25, 1901, there exists in the Malay Archipelago a practice of malingering by shamming beriberi, which it is almost impossible to diagnose from the real case. It occurs mostly in the prisons where men who show symptoms of beriberi are liberated. Oedema is produced in a very simple manner. A fine hole is drilled into the leg and a small hair is inserted. After the skin has grown over the aperture thus made, swelling sets in, which pits like the oedema in real beriberi. Great lassitude and feebleness follow.

**BACTERIOLOGY AND PATHOLOGY OF DIPHTHERIA.**—Councilman, Mallory, and Pearce<sup>1</sup> give the results of the study of two hundred and twenty cases. The largest number, thirty-four, of mixed infections were found in scarlatina, and in most of these the clinical history showed that the two infections were not synchronous. Tuberculosis as a coincident infection they believe to be due to the general prevalence of tubercular bacilli, affecting children at a very early age. They cannot say positively whether the diphtheritic bacillus continues to produce its toxins in the blood and internal organs, but they think it probable from the number of such infections found in fatal cases. Bronchopneumonia was recognized by them in one hundred and thirty-one cases, ninety-eight being pure diphtheria and thirty-three cases complicated by scarlatina or measles. Infection of the antrum Highmorianum is common, explaining the persistence of the bacillus in cultures from the nose long after the membranes have disappeared. Examinations of the middle ear disclosed the fact that in one hundred and forty-four cases the bacillus was present in eighty-six. A clearly defined membrane was found in one hundred and twenty-seven cases, in sixty-five on the tonsils, sixty on the epiglottis, seventy-five in the larynx, sixty-six in the trachea, fifty-one in the pharynx, forty-three in mucous membrane of the nares, forty-two in bronchi, thirteen on soft palate, twelve in oesophagus, nine on the tongue, five in stomach, duodenum one, vagina two, vulva one, skin of the ear one, and conjunctiva one. (Figs. 20 to 25.)

*The Histological Characteristics of the Diphtheritic Membrane.*—Microscopically two distinct varieties were found—the dense, firm, elastic membrane, which can be stripped off in large flakes, and which is composed of a reticular structure, with considerable uniformity in the reticulation, and a more friable membrane composed of fibrin. In the latter the reticulation varies greatly in the size of the fibres composing it and the spaces between. Beneath the membrane the epithelium is

<sup>1</sup> Diphtheria, Journal of the Boston Society of Medical Sciences, vol. v.; published in pamphlet form by the Henry F. Sears Fund, 1901.

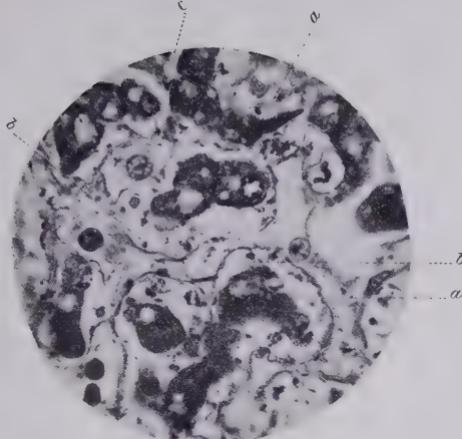


FIG. 20.—Section of liver through an area of central necrosis. The liver cells are broken up, separated from their connections, and lie in large spaces. *a*, liver cells; *b*, walls of capillaries; *c*, endothelial cell in capillary.

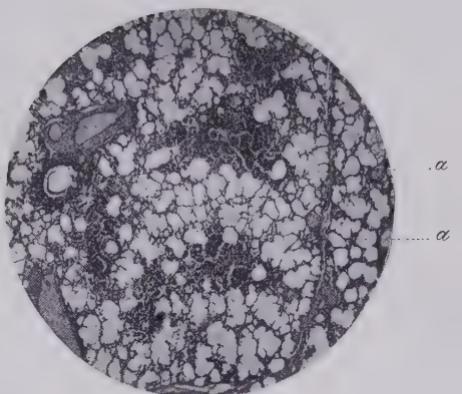


FIG. 21.—Section of lung, showing several small foci of exudation affecting terminal bronchi and atria. *α*, *α*, *α*, terminal bronchi.

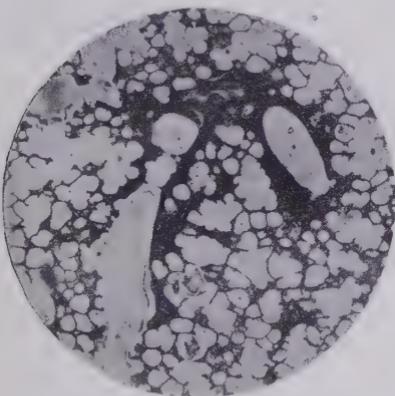


FIG. 22.—Longitudinal section of terminal bronchus and bronchial passage, showing gradual downward extension of the exudation.



FIG. 23.—Convoluted tubules of kidney, showing cloudy swelling. The cells are greatly swollen and the granules increased in size and number. The ciliated borders of the cells are irregular.



FIG. 24.—Recent blood-plate thrombus in heart.

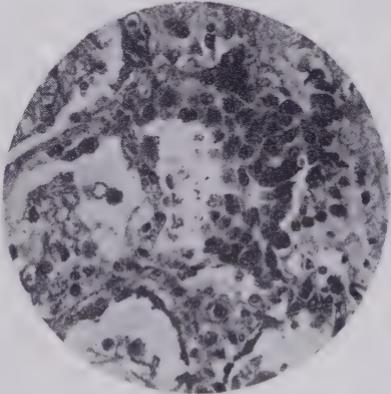


FIG. 25.—Section of the lung from a case of interstitial pneumonia, showing great swelling and proliferation of the lining epithelium.



usually absent. The diphtheritic bacilli were never found growing on the living tissues, or on the degenerative lesions in the epithelium, but were seen in the necrotic tissues and in the exudation, usually in the latter only; they appeared in clumps and masses. Where these masses were deeply buried in the membrane, they probably had been covered up by subsequent membranous growth. The bacillus was found more often in the reticulum than in the spaces. The observers hazard the suggestion that the initial lesion is due to the toxic action of bacilli growing in the fluids of the mouth or throat, and necrosis once occurring the necrotic tissue forms a culture medium. The formation of the membrane is due to a union of several processes—the degeneration and necrosis of the epithelium, an inflammatory exudate which comes from beneath and forms fibres when in contact with the necrosed epithelium, there being nothing specific in the membranous formation, typical fibrous and hyaline membranes being found without bacteria and in ovarian cysts.

Degeneration of the myocardium is one of the most frequent effects of the action of the toxic products, varying from simple fatty degeneration to acute interstitial lesions. The involvement of the lungs was found to be most frequent of all and a prominent cause of death. Bronchopneumonia was frequent. In the kidney the lesions varied from simple degeneration to more serious acute nephritis. The lymph nodes most affected are those nearest the primary lesions. The most common condition found in all was a sharp separation between the lymphoid tissue and the sinuses, due to dilatation of the latter.

**COMPARATIVE PATHOLOGY.**—How closely the diseases of animals are related to the diseases of men we are finding out in recent times, and the study of animal disorders is being pursued yearly with greater interest. The relation of certain animal and certain human diseases is often hidden by great differences of symptoms and localization, but the bacteriologist cuts the Gordian knot at a blow. There is evidently, however, here a great tract of undiscovered country, and as to the actual origin of certain diseases we are as much in the dark as ever. Where did diphtheria originate? Did smallpox come from the camel to man, and from man to the cow? How are diseases changed by transmission through animals? In vaccinia we have apparently a modification, an amelioration by which man has profited largely. But, on the other hand, may not certain human disorders transmitted to animals be returned to man with greatly increased virulence? Can we find another vaccinia?

As we look at the catalogue of human ills we are more and more surprised at the great number of points at which human and animal

diseases touch. Animal diphtheria, long unsuspected, is now a certainty, and its conveyance from animals to man in virulent form is no less certain. Tuberculosis is still under observation. Scarlet fever has been traced to an animal source by more than one convinced investigator. Plague is associated with rats, malaria and yellow fever with mosquitoes; fleas have long been under suspicion; parrots have infected human beings with a specific and fatal pneumonia. The coryzas and catarrhs of horses have been transferred to human beings, tetanus also, and rabies, glanders, and anthrax, and, if we believe its supposed etymology, syphilis; and not only eruptive and acute disorders, but morbid growths, parasitic diseases like *tænia*, hydatid disease, trichinæ, and actinomycosis, and skin diseases like ringworm; even leprosy has been considered to be derived from fish. The catalogue is almost endless, and we see a reason for a closer study of animal diseases. The manufacture of serums also calls for the completest possible knowledge of the animal from which the serum is derived. Yet all these studies are in their infancy; one cannot mention a subject in which there is not a vast deal yet to learn. Tuberculosis, studied so long and so ardently, is not half known. Carcinoma may yet be found to have an animal origin. Comparative studies, therefore, are destined to acquire a greater interest in the future, and to them we must look for the solution of many grave problems on which will depend the health of the race.

It is almost impossible for any one but the bacteriologist to keep up with the rapidly increasing progress of his branch of knowledge. Every day adds new microbes; every day some observer stumbles on some amazing fact. The observations of some experimenters on the effect of the emulsion of certain animal organs when injected into the circulation of animals of the same and those of different species, if confirmed, would throw light upon the most mythical story of subtle poisoning ever found in mediæval legend. The public already expect the discovery of the bacillus of old age, and its antidote, an eternal youth as the result. The Widal reaction has established itself more firmly, and its underlying principle is found to be more far-reaching than was at first imagined. With such an army of observers as now exists the strides of our advance must be great; and now we have not only observers but also reasoners and acute experimenters in this branch of medical science, soon to hold in their hands the power to infect a world or free a world from infection. And it is owing to their labors that advancing epidemics are robbed of half their terrors, since hourly the world at large relies more and more on the man with the microscope. This reliance sometimes is too great.

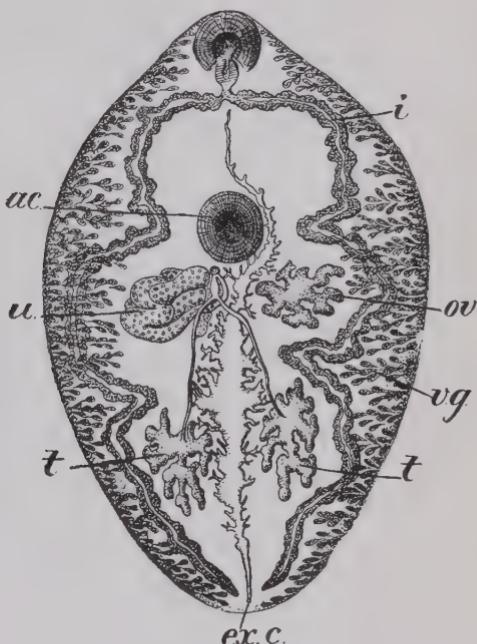
PARASITIC HÄMOPTYSIS.—The Bureau of Animal Industry of the Department of Agriculture issued, on December 31, 1900, an interesting report of "Notes on Parasites," by Drs. Charles Wardell Stiles and Albert Hassall.<sup>1</sup> They call attention to the fact that they have

FIG. 26.



Egg of the lung fluke from man, containing a ciliated embryo. (Enlarged.)

FIG. 27.



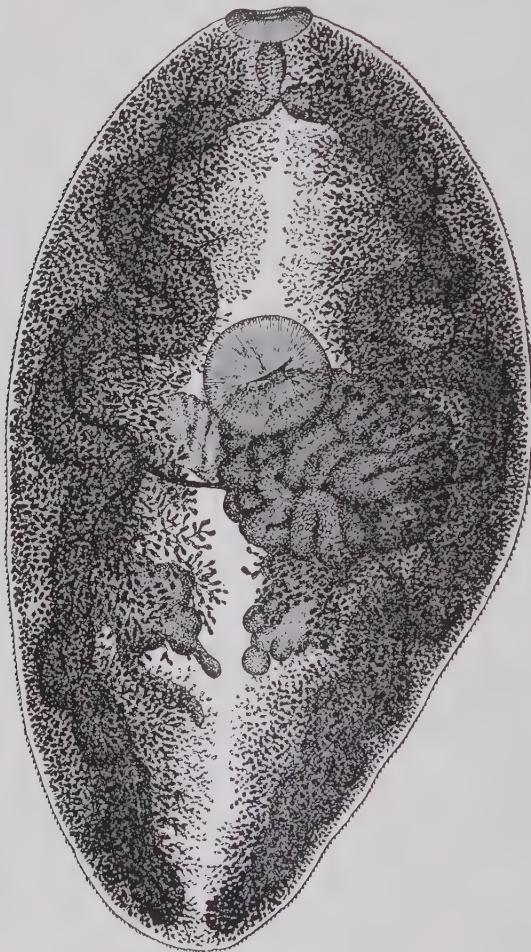
Ventral view of a lung fluke from man, showing anatomy. *ac*, acetabulum; *ex.c.*, excretory canal; *i*, intestinal caeca; *ov*, ovary; *t*, testicles. (Enlarged.)

investigated more than fifty cases of infection in hogs by a lung fluke belonging to the genus *Paragonimus*, family *Fasciolidae*. These flukes, which were found encysted in the lungs of the swine, appear to be identical with the lung fluke which in Asia has produced parasitic haemoptysis in man. The medical aspect of the parasite is doubly important now that so many American troops are returning from service in the Philippines, from which point they may introduce the disease to America; and also from the fact of the report of its discovery in hogs by the inspector of the Bureau of Animal Industry in Cincinnati. *Paragonimus Westermanii* was originally described in 1878 by Ker-

<sup>1</sup> We are indebted to the United States Department of Agriculture for kindly sending us the electrotypes of Figs. 26, 27, and 28, and for giving us permission to reproduce the colored plate (Fig. 29).

bert, who discovered it in the lungs of a tiger which died in a menagerie in Amsterdam. Other observers have found it in the dog, the cat, and the hog. As long ago as 1880 Manson reported its existence in

FIG. 28.



Ventral view of a compressed specimen of a lung fluke from a hog. (Greatly enlarged.)

man. The complete life cycle of the lung fluke has not yet been demonstrated experimentally; Stiles and Hassall state that the egg does not develop until it leaves the host in the sputum. Manson and the Japanese observer Nakahama have been able to hatch the eggs in water kept at a temperature of from 80° to 94° F. Manson believes that upon expectoration from the lungs the eggs perish unless they are free





FIG. 29.—Contents of a lung-fluke cyst from a hog, containing eggs of the *Paragonimus Westermanii*. (Greatly magnified.)

from the surrounding mucus and have access to water. As yet it is unknown how long the eggs preserve their vitality in dried sputum or dust (Fig. 29).

All Asiatic observers look upon water as the source of the infection, and they also advise against eating raw eggs and other uncooked foods, mussels, etc., in regions infected by the fluke. This disease has become so extensive in certain parts of Formosa that it is estimated that fifteen per cent. of the inhabitants are affected. The disease appears to be rarely seen in very young or very old persons, being more common in youth and early manhood. It is generally conceded that occupation, drinking habits, and physical condition are without special significance. The prognosis depends upon the number and location of the parasites in the body. If the worms are confined to the lungs the patient may live for years, but if they gain access to the brain prognosis is unfavorable.

In reference to diagnosis, the existence of hæmoptysis and the possibility of exposure to the infection must be remembered, but it must be confirmed by the microscopic examination of the sputum for *Paragonimus* eggs. The fluke itself is a worm from eight to sixteen millimetres long, from four to eight millimetres broad, and from two to five millimetres thick.

As yet the treatment of this condition is entirely problematical. Inhalations of various drugs atomized by Lister's steam apparatus have been tried, but with no special results. Taylor believes that there is as yet no specific, excepting general treatment to maintain the health of the patient. He states that exertion aggravates the cough and expectoration, and that patients learn instinctively to spend most of the time in bed when at the worst. There are cases on record in which as many as twelve thousand eggs have been expectorated daily.

RAPID DIAGNOSIS OF RABIES.—Recently, Nelis, working with Van Gehuchten, discovered in the spinal ganglia of two men who had died of rabies, and of a number of animals, peculiar changes which they considered to be the diagnostic lesion of the disease.<sup>1</sup> They have confirmed all the lesions described by other authors, but in addition have noted what they consider to be more diagnostic than any other. The most profound, the most constant, and the earliest lesions are found in the peripheral, cerebral, and sympathetic ganglia, and the changes are especially marked in the intervertebral ganglia and in the plexiform ganglia of the pneumogastric nerve. Normally, these ganglia are composed of a supporting tissue holding in its meshes the nerve-

<sup>1</sup> Monthly Cyclopædia of Medicine, February, 1901.

cells, each one of which is inclosed in an endothelial capsule. The changes characteristic of rabies consist in the atrophy, the invasion, and the destruction of the nerve-cells brought about by new-formed cells derived from the capsule, which appear between the cell-body and its endothelial capsule. These new-formed cells increase in number, invade the protoplasm of the nerve-cell, and finally completely occupy the entire capsule. In answer to objections raised by Nocard and others, Van Gehuchten says that "the lesions of the cerebrospinal and sympathetic ganglia which he and Nelis have discovered are not specific of rabies in general; they are only specific of the disease as it occurs naturally." The authors have made no claim regarding an early diagnosis of rabies, but only a rapid method.

The method of procedure recommended by Van Gehuchten and Nelis is as follows: The ganglion is put at once into absolute alcohol, in which it is left for twelve hours, the alcohol being changed once. It is then transferred for one hour to a mixture of absolute alcohol and chloroform, next put for one hour in pure chloroform, then for one hour in a mixture of chloroform and paraffin, and lastly in pure paraffin for one hour. The sections are put in the oven for a few minutes, then passed through xylol, absolute alcohol, and ninety per cent. alcohol, after which they are stained for five minutes in methylene blue, according to Nissl's formula, differentiated in ninety per cent. alcohol, dehydrated in absolute alcohol, and cleared in essence of cajuput and xylol. If frozen sections are cut, they are put for a few minutes in ninety per cent. or ninety-four per cent. alcohol. In personal work ten per cent. formalin has generally been used for fixing the tissues. They are then transferred to ninety-five per cent. alcohol and finally to absolute alcohol. For the most part the tissues have been cut without embedding, being attached to blocks by the aid of mucilage of gum arabic, though in some cases celloidin has been used. For the bringing out of the chromatolytic changes the Nissl method has proved the best, but the capsular changes were best brought out in sections stained by haematoxylin and eosin.

From personal study of this subject, Ravenel and McCarthy<sup>1</sup> have come to the following conclusions: 1. When present, the capsular and cellular changes in the intervertebral ganglia, taken in connection with the clinical manifestations, afford a rapid and trustworthy means of diagnosis of rabies. 2. Absence of these changes does not necessarily imply that rabies is not present. The lesions afford contributory evidence more or less valuable, depending on the duration of the clinical

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<sup>1</sup> University Medical Magazine, January, 1901.

manifestations. 3. In certain cases where the capsular changes are slight, as in animals dying or killed in the early stages of the disease, the changes are more marked in the distal end of the ganglion. 4. The rabic tubercle of Babes is present sufficiently often to furnish valuable assistance in cases where only the central nervous system is obtainable without any of the ganglia, but in cases where the ganglia can be had they offer a simpler and easier method of diagnosis than do the brain and cord themselves.

**RINDERPEST.**—Lingard<sup>1</sup> reports that the inoculations against the rinderpest have met with marked success. Small doses of a protective serum were injected on one side and small doses of virulent rinderpest-blood on the other. The immunity lasts for the natural life-time of the animal inoculated. The use of the serum alone caused no reaction and but temporary immunity.

**VELDT SORE.**—This superficial infected blister, which bears a close resemblance to the onychia found in mill-workers, is described by Ogston<sup>2</sup> as being seen only in South Africa, from which peculiarity it derives its name. It occurs generally on the hands, forearms, feet, and legs. Suppuration is not noticed in these sores, but simply crusts of dried serum covering them. It has been found that these conditions are due to a micrococcus, which resembles closely in appearance the gonococcus, and which is believed to be an inhabitant of the vegetation and soil of this region.

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## NEW INSTRUMENTS AND DEVICES.

MUCH time and ingenuity are spent by surgeons in improving their instruments, simplicity of construction and ease of cleansing being now the chief desiderata. Physicians, too, have many practical devices which are unpublished, and hence generally unknown to the medical profession.

**A NEW STETHOPHONOMETER.**—Albert Abrams<sup>3</sup> has devised a new instrument on the disc-valve principle weighing only two ounces; with it he believes greater scientific precision can be reached in auscultation.

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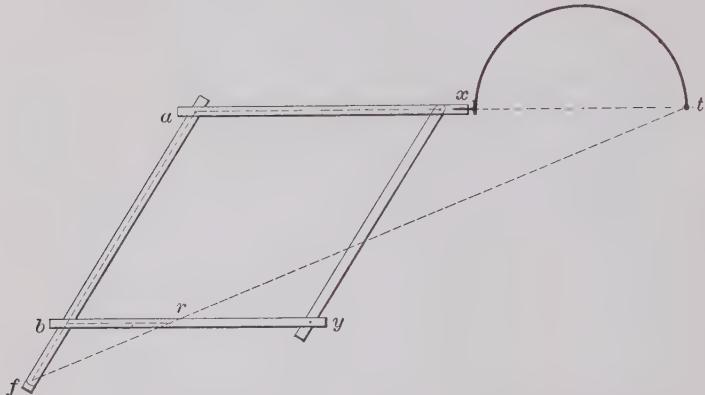
<sup>1</sup> *The Lancet*, March 16, 1901.

<sup>2</sup> *British Medical Journal*, April 20, 1901.

<sup>3</sup> *New York Medical Journal*, February 16, 1901.

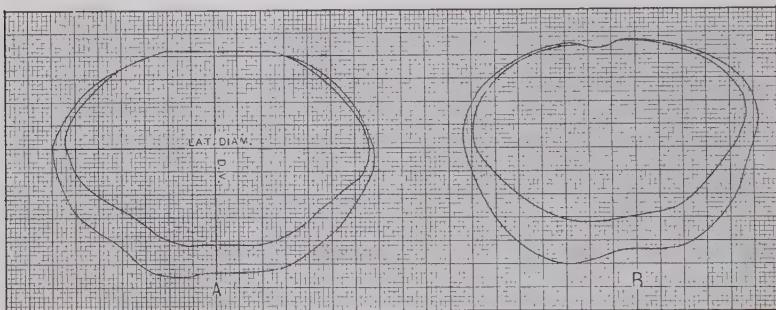
**THE AKOUPHONE.**—This is described by Kenefick as a telephonic apparatus for the use of the deaf. The electric force comes from a battery concealed upon the person. This is useful in all cases except those of complete deafness with centric destruction of the nerve function.

FIG. 30.



The chest pantograph. Constructed of brass or wood, with brass or steel semicircle.

FIG. 31.



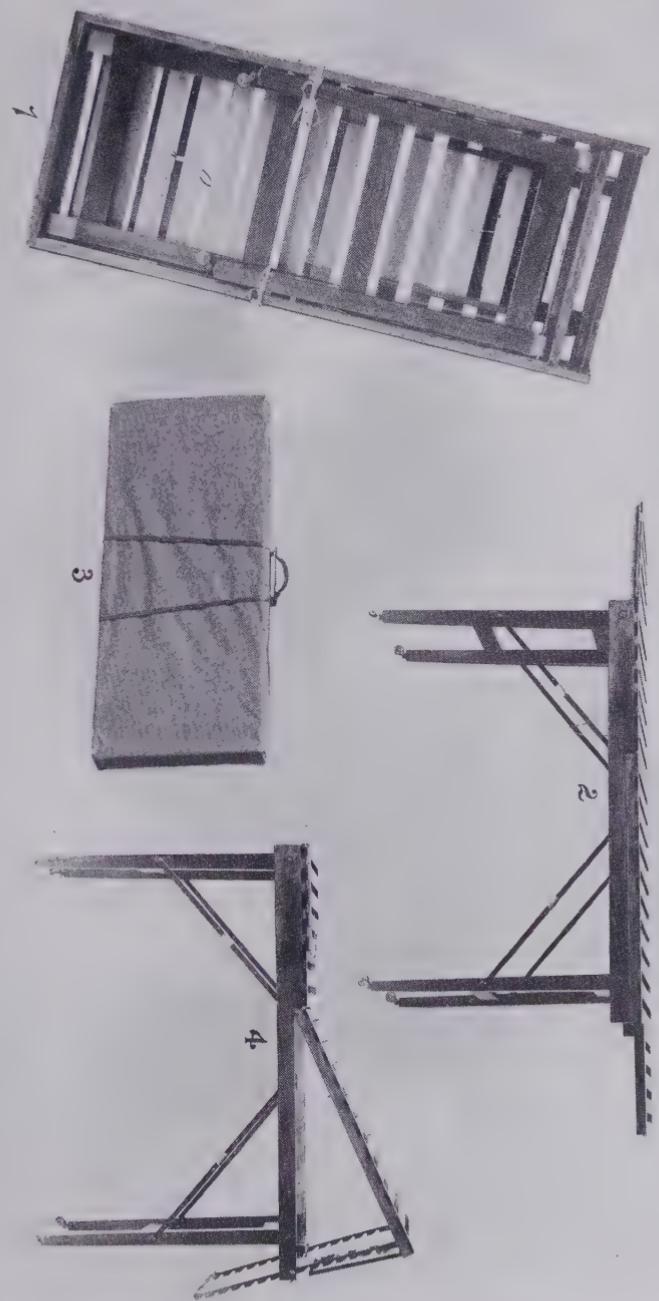
Two contours from healthy young men. Two millimetres in the figure illustrate one centimetre of actual measurement. The inner contour is that of forced expiration, and the outer one of forced inspiration.

**THE CHEST PANTOGRAPH.**—The chest pantograph devised by Professor W. S. Hall measures and records chest contours, reducing the record to a size convenient for preservation (Figs. 30 and 31).

**NEW INSTRUMENTS.**—Sherman, of West Newton, Mass., describes<sup>1</sup> a portable operating table (Fig. 32), which measures when closed forty-

<sup>1</sup> American Medicine, October 29, 1901.

FIG. 32.—Portable operating table: 1, closed; 2, open; 3, packed in bag; 4, Trendelenburg position.

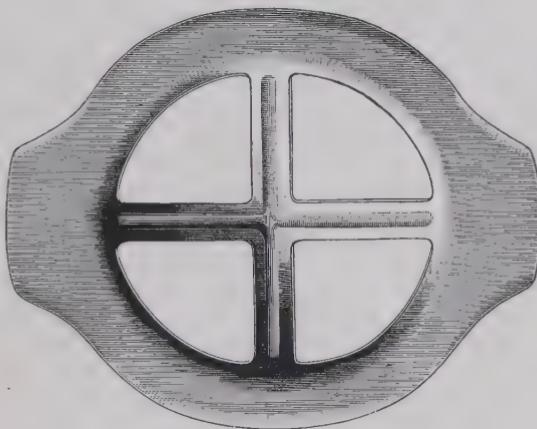




eight inches by twenty inches by four inches, and weighs thirty pounds. It is constructed of wood, with hinged steel braces from the legs to the body of the table, and a steel support for the Trendelenburg position.

C. P. Franklin, M.D., of Philadelphia, has designed a vaccination shield<sup>1</sup> which is made of aluminum, and is six centimetres in diameter

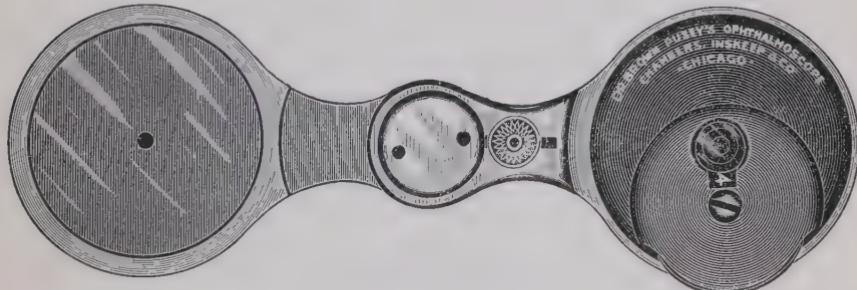
FIG. 33.



Vaccination shield.

to the inner edge of the flange. The latter is rounded, to prevent sharp edges. There are two ribs in the centre, crossing at right angles at a point one centimetre above the plane of the base (Fig. 33). It may be readily curved to fit the arm, can be washed and sterilized; it does not confine the wound, and is light and durable.

FIG. 34.



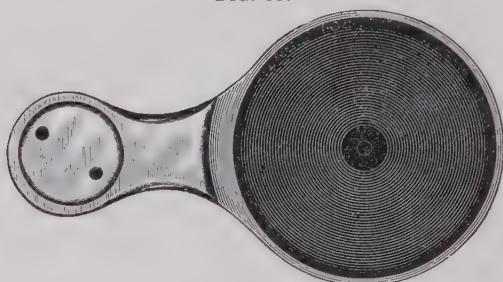
Pocket ophthalmoscope; open.

With a view to securing a vest-pocket instrument which does not call for a box or case, Dr. Brown Pusey, of Chicago, has had con-

<sup>1</sup> Journal of American Medical Association, December 21, 1901.

structed a new ophthalmoscope (Figs. 34 and 35). The arms carry two mirrors, which are so placed that when the instrument is closed

FIG. 35.



Pocket ophthalmoscope; closed.

the mirrors lie face to face. The mirrors are circular, with a diameter of one and three-sixteenths inches; the concave mirror has a focal length of eleven inches. A wheel back of the concave mirror carries five lenses. The instrument weighs less than two ounces; it is one-quarter of an inch thick and two and three-eighths inches long when closed.<sup>1</sup>

A new pile-clamp has been shown by Rufus D. Mason, M.D., of Omaha, Neb.<sup>2</sup> It is made with smooth, tapering jaws (Fig. 36), and

FIG. 36.



New pile-clamp.

is adapted to pile operations, and to any other use where a clamp may be needed in abdominal or pelvic cases. The opposing edges of the jaws are notched to secure good holding qualities.

The main shaft of the new adenoid curette (Fig. 37) described by W. Stanley Sampson, M.D., of Lancaster, Ohio, is fourteen centimetres long, and is attached to a pistol grip. A slide with two rings rests upon this shaft, and a second shaft is attached to this slide; the blade can be moved forty-five degrees backward or forward when traction is made upon the rings. The two blades resemble the Gott-

<sup>1</sup> Journal of American Medical Association, December 21, 1901.

<sup>2</sup> Ibid., November 9, 1901.

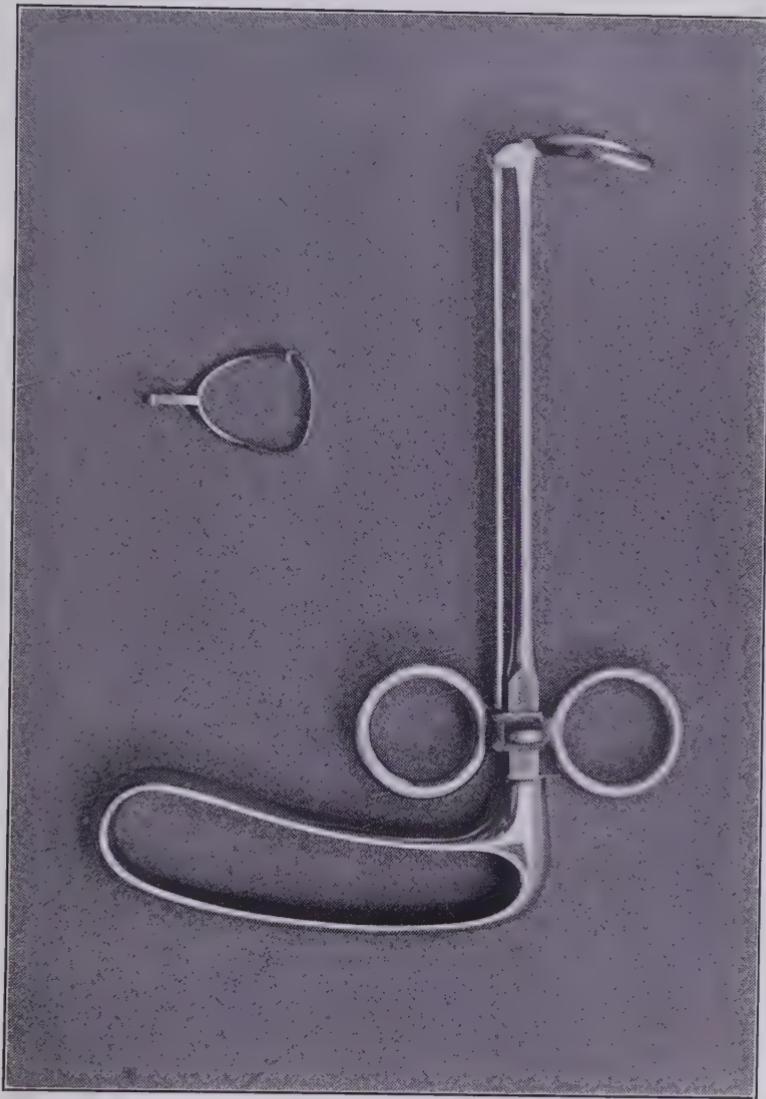


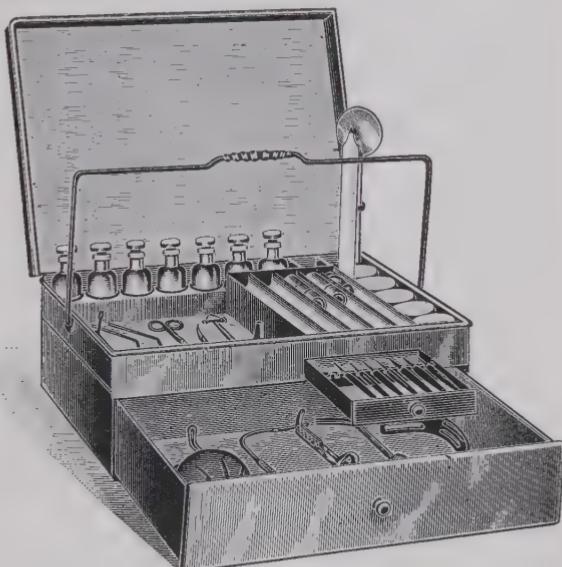
FIG. 37.—New adenoid curette.



stein blade in general. The dull blade has no cutting edge, and is used in soft growths. The knife is only two millimetres wide. The shaft can be maintained at the same relative position and the blade brought against the chorïæ, and then swept over the vault, embracing the largest growths. The instrument is aseptic and the blades are interchangeable.

Frank Allport, M.D., of Chicago, calls attention to several new instruments.<sup>1</sup> Fig. 38 shows an eye and ear case for hospital work,

FIG. 38.



Eye and ear case for hospital work.

constructed of nickel-plated copper. It is furnished with a handle, for easy transportation, and a cover. In the several compartments may be placed head mirrors, insufflators, tuning-forks, solutions, ointments, cotton, knives, scissors, forceps, etc. A simple gauze packer

FIG. 39.



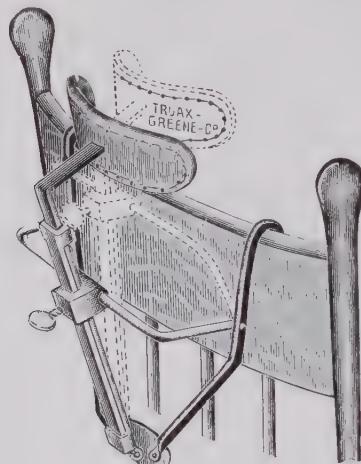
Simple gauze packer.

(Fig. 39) has an end which is conical, presenting no tendency to withdraw the gauze as the instrument is withdrawn. The head-rest

<sup>1</sup> Journal of American Medical Association, November 16, 1901.

shown in Fig. 40 may be used on the back of any ordinary chair, and is found to be useful for the examination and treatment of eyes and

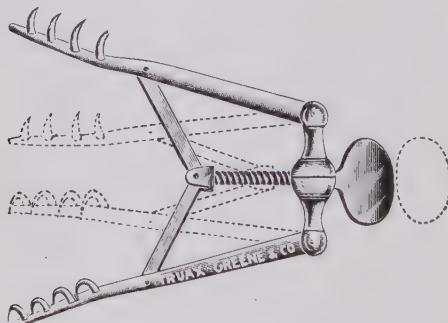
FIG. 40.



Head-rest, for attachment to any chair.

for many small operations. For operations on the mastoid bone, Dr. Allport uses self-retaining retractors (Fig. 41), and calls attention

FIG. 41.



Mastoid retractor.

to the necessity for making the screw long, to permit of wide dilatation, and the head of the screw flat to enable the operator to use all needed force.

The danger of infection from the skin surface in the field of operation is so great, and the sterilization of this surface is so difficult, that Dr. J. B. Murphy, of Chicago, made a great effort to secure a sterile, adhesive rubber dam which would adhere to the surface with





FIG. 42.—Adhesive rubber dam.

sufficient tenacity, and be readily removable at the termination of the operation.<sup>1</sup> All of the difficulties have now been overcome, and an adhesive rubber dam has been produced which is sufficiently adhesive to stand considerable traction without separating from the skin (and this adhesiveness may be increased by spreading a little ether over its surface), and is not affected by water, antiseptics, or wound secretion. It is prepared and sterilized, placed in sterile envelopes, and these again placed in other envelopes. The field of operation is prepared in the usual way, then dried and wet with ether, and the dam applied (Fig. 42). The incision is made through the dam and skin. Dr. Fenton B. Turck, in a later communication to the publication mentioned, calls attention to his published suggestions concerning the use of an adhesive rubber dam prior to the publication of Dr. Murphy's article.

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#### THE EIGHTIETH BIRTHDAY OF RUDOLPH VIRCHOW.

VIRCHOW was born of humble parentage eighty years ago in a small Pomeranian village, and as a scientist stands at the threshold of the twentieth century without peer or rival. His contributions to science have been many and valuable. Besides possessing a wide knowledge of medicine, he is no mean authority on ethnology and anthropology. As an archæologist and Egyptologist he ranks among the foremost. Besides occupying himself with scientific subjects, this remarkable worker became the leader of a party containing the best minds in the empire, and, always consistent and purposeful, strove for the betterment of the masses. He is a linguist of great ability, and at the various medical congresses has always been able to make his address in the vernacular. He taught the Italians to honor the name of Morgagni and the English that of Glissin. The eightieth anniversary of his birth was celebrated with befitting ceremonies at Berlin in November last. On the afternoon of the 12th a reception was held at the Pathological Institute, followed in the evening by a banquet and official reception in the Hall of Parliament. Emperor William conferred upon him an order and a medal, and Secretary Waldeyer, in behalf of the medical men of Germany, presented fifty thousand marks to the Virchow Research Fund. Not only in Berlin did the physicians gather to do honor to this most remarkable man, but in other and distant parts of the

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<sup>1</sup>Journal of American Medical Association, May 4, 1901.

globe the medical fraternity joined to commemorate his natal day. In New York City a banquet was held, at which addresses were made by Jacobi, Osler, A. H. Smith, and Welch. St. Louis celebrated the event by a dinner presided over by Dr. Luedeking, at which were present more than one hundred of the most prominent physicians of that city.

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#### DEATH OF PRESIDENT McKINLEY.

KINGS and queens and men of note, in former days, have died because their exalted position paralyzed the arms that would have gladly aided one of lower degree, but in recent times surgical skill has been more ready to disregard the rank of the sufferer and to do its best, alike for prince and pauper. We in America have had our share of such emergencies, and the last one—the wounding of President McKinley while visiting the Pan-American Exposition at Buffalo, on September 9, 1901—will linger long in the memory of the public and be recalled by the profession as a celebrated case of prompt, brave surgery that deserved, it would seem, a better reward.

The only wound of the President that needed any special care was the one made by the ball which penetrated the left hypochondriac region; the other was trivial. This wound showing no point of exit of the ball, it was determined, after a necessarily brief consultation among the surgeons who could be immediately obtained, that it should be followed, and that the proceedings proper in penetrating wounds of the abdomen should be carried out as soon as possible.

In about an hour after the shot was fired (Dr. Wasden giving ether, for the President's heart was known to be weak), Drs. Mann and Mynter, assisted by Drs. Lee and Parmenter, opened the peritoneal cavity and discovered a bullet wound of the anterior wall of the stomach, near the greater curvature; the edges were clean-cut, and were approximated by the Czerny-Lembert suture. The abdominal incision was slightly enlarged and about four inches of the gastro-colic omentum divided to reach the posterior wall of the stomach. Here a second somewhat larger wound was found, with frayed and infiltrated edges; these were united by a double row of sutures, but further search for the bullet was discontinued on account of the condition of the patient's pulse. The operation lasted an hour and a half, and the President was then carried to a private house in Buffalo and put in charge of Dr. Rixey, U. S. N., who was later assisted by Dr. Wasden. For a while the

President's condition seemed to improve, and daily and favorable bulletins were in consequence issued by general consent of the attending physicians; these often expressing great hope of his recovery. Dr. McBurney and Dr. Stockton were later added to the staff of consultants (Dr. Janeway and Dr. Johnson, who were summoned still later, did not arrive until after the President's death). The patient's temperature during the days following the injury ranged from 100 to 102 degrees, but his pulse (thin most of the time) was disproportionately high, ranging between 140 and 145. The urine was scant, with a trace of albumin, some casts, and much indican. Nutritive and saline enemata were employed to sustain him, and on the seventh day the patient was given nourishment by the mouth. The intense pain was controlled by morphine and such cardiac tonics and stimulants as met the needs of the hour; but the President's heart began to fail on the evening of the eighth day, and, stimulants no longer availing, he died in the early morning of September 14.

The autopsy was performed by Drs. Gaylord and Matzinger, nine hours after death. Rigor mortis was marked; sternal wound superficial, cultures from it showing *Staphylococcus epidermidis albus* of Welsh. Abdominal fat well developed and normal in color; ventral wound showed little effort at repair; cultures showed *Staphylococcus albus*, and a short encapsulated bacillus thought to belong to the proteus group, but no streptococci here or elsewhere. The stitches uniting the wounds of the stomach were intact, surrounded by discolored friable areas, and each had been reinforced by adhesions.

Behind the stomach was a large necrotic cavity, fibrin-lined, involving the pancreas and extending downward and backward towards the left kidney, where it ended in a *cul-de-sac*. Tissue elements from it were unrecognizable. Neither leucocytes nor pus-corpuscles were found, but an abundance of fat-like crystals. The left kidney was congested and lacerated, and the adrenal gland seemed injured; but there was no sign of peritonitis. The heart-walls were thin and surrounded by much adipose tissue; other organs normal.

Bacterial examination of the weapon (a 32-calibre revolver) from which the fatal shot had been fired showed simply the presence of staphylococci. Dr. Hill, by chemical analysis, disproved the current suspicion that the cartridges had been poisoned.

That the autopsy was abruptly concluded and the bullet left undiscovered was owing to the wishes of the family of the deceased President. It is to be regretted that the autopsy was not thoroughly completed and material allowed to be taken as a basis for further scientific study.

The assassin of the President (Leon F. Czolgosz, aged twenty-eight,

and an American by birth), after speedy trial, was executed at Auburn Prison in the electric chair. The autopsy was immediately thereafter made by Drs. McDonald, Spitzka, and Guerin, but neither abnormality nor lesion was found; his brain was slightly above the average, and the conclusion reached was that his intellect was not impaired, confirming the opinion of Fowler, Crego, and Putnam, who examined him prior to his trial.

C. K. Mills believes from the evidence that he was mentally sound at the time of the assassination, but that had he lived longer he would probably have developed tendencies to insanity.

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